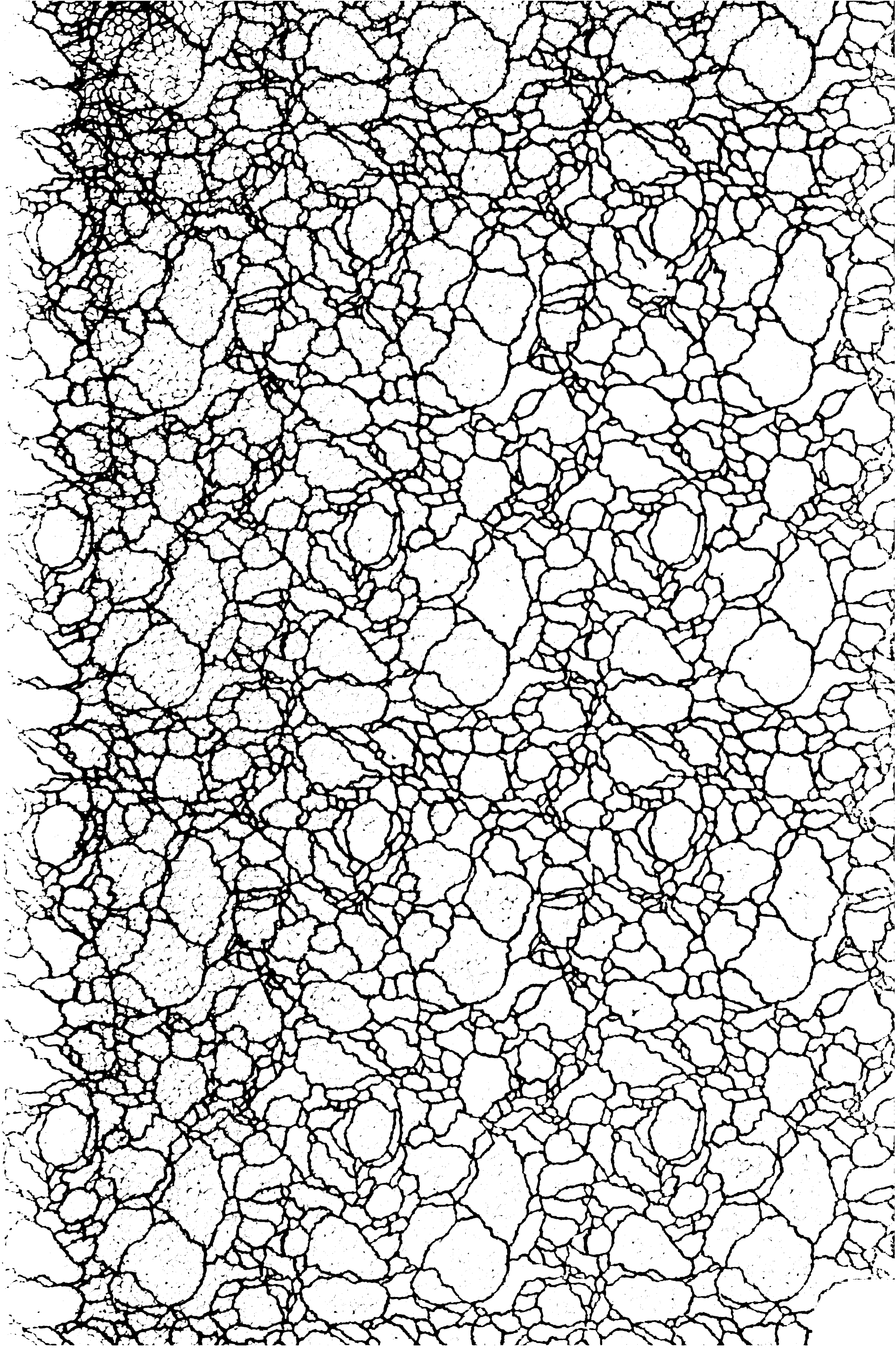

B. C. OLIPHANT, President

PROCEEDINGS

OF THE

Natural Gas Association of America

[illegible]ENTH ANNUAL MEETING

HELD AT

Broadway Auditorium, Buffalo, N. Y.

May 18th, 19th and 20th, 1920

Published by the Association
Edited by the Secretary.

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Columbus, Ohio
1921

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OF THE

NATURAL GAS ASSOCIATION OF AMERICA, 1920

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FIFTEENTH ANNUAL MEETING

OF THE

Natural Gas Association of America

HELD

MAY 18th, 19th and 20th, 1920

PROCEEDINGS

FIRST DAY—MORNING SESSION

TUESDAY, May 18th, 1920.

The Fifteenth Annual Meeting of the Natural Gas Association of America convened at the Broadway Auditorium, Buffalo, New York, ten o'clock a. m. Tuesday, May 18th, 1920, with B. C. Oliphant, Buffalo, New York, as President, and Wm. B. Way, of Pittsburgh, Pa., as Secretary.

The following reported their attendance:

ABBOTT, D. E.
ADAMS, C. H.
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ALLEN, S. S. JR.
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PRESIDENT OLIPHANT: Gentlemen, you will please come to order. With your permission I now declare the Fifteenth Annual Meeting of the Natural Gas Association of America convened.

It gives me great pleasure to introduce to you as the representative of the Mayor of the City of Buffalo, Mr. E. J. Sweeney, who comes to welcome us on behalf of our beautiful city.

MR. E. J. SWEENEY, City Clerk, City of Buffalo, New York, then delivered the following:

ADDRESS OF WELCOME

Mr. President and Members of the Natural Gas Association of America:

I come here today as the representative of the Council of the City of Buffalo. His Honor, the Mayor, unfortunately for us and equally unfortunately for you, has been seriously ill for several weeks and could not come here this morning to welcome

you to Buffalo but has directed me to come in his stead. We are happy to have you with us. We appreciate the compliment of your presence here and we trust that your deliberations will be such that the benefits will not only accrue to the membership of the Natural Gas Association of America and to all of the varied interests it represents but that they will accrue also to the betterment of the communities which go to make up this great country of ours and particularly are we interested at all time in our own community.

The natural gas problem during the past winter has been a very severe one due to the ntaural unrest of the people following the war and during the period of reconstruction and has found expression in discontent. Our people have felt that they have not had the proper gas pressure during the past year and naturally there has been complaint about it. But we have been told by the representatives of the gas companies and by the authorities at Washington that the natural gas situation is very bad and that the supply is gradually decreasing.

There is this point—and I will not take up your time with any discussion of our difficulties because you have your own but the great tendency of population into the cities which has not abated in the last fifty years or the last forty years at least has made the city problem a tremendously difficult one. The city of today is so vastly different from the city of even twenty-five years ago that not only its frame work but most of its problems are new and many of them as yet are unsolved today.

In 1810 the City of New York had a population of 100,000 people and the budget for the City of New York that year was just $100,000.00.

In 1864 the City of Buffalo had a population of 100,000 people and our budget that year was $565,000.00; last year the City of Des Moines, Iowa—or rather two years ago the City of Des Moines had a population of 100,000 people and the budget of Des Moines was practically $3,500,000.00.

This year the City of Yonkers in this State has a population of 100,000 people and the budget for Yonkers this year is $5,000,000.00 so that the city of 100,000 people has increased in cost from 1810 down to the present time from $100,000 to

$5,000,000.00; and that is not due to the increase in cost of labor and material or supplies but it is due mostly to the increased activities of a modern city government.

At that period three per cent. of the population of the country lived in the cities. Today upwards of forty-nine per cent. of the population of the country lives in the cities. At the beginning of that period the wealth of the country was in land and agricultural resources but today the greater portion of the wealth of the country is invested in great industrial enterprises, in public service utilities, in manufacturing establishments, so that a tremendous change has come over the country.

Galveston realized through a catastrophe what many cities do not yet appreciate, that business methods are the predominating basis for municipal government and today the city governments of this country are striving to establish our municipal government on a sound business-like basis. We recognize that the day of political supremacy has passed if a city is to be well conducted. And the great effort now is to establish our municipal governments on the same line with reference to business methods as the great corporation runs its business. Now, to accomplish that and to work out a proper functioning with the public service corporations is the all important problem to solve in the modern municipal government. You realize as well as I do with this great concentration of population, next to our water supply, our transportation problems and our lighting and heating problems are closely allied with the conduct of a municipality. In fact they are so corelated that it is difficult to separate them and there must be business-like, sound and practical co-operation between the municipalities and those who serve the people in a great municipality. So that your interests and our interests are practically identical today, and we must solve them along sound practical business lines.

Therefore, it is a great pleasure to us in Buffalo, to those in the city government, to the Mayor and to the Members of Council, who could not be here this morning, to have you here and to watch you work out these important problems, knowing full well that the solution of them means a great deal to the city and the citizenship thereof. Aside from your business delibera-

tions I trust you will enjoy yourselves socially, for Buffalo has always been a social municipality and is far-famed for its hospitality; it is a city of homes and we have our splendid parks and splendid places of entertainment which your entertainment committee will undoubtedly point out to you. Our close proximity to the Canadian border enables us to give the Volstead Act a pretty good run even without the aid of the United States Supreme Court (great laughter), and so Mr. Way and Mr. Adams can tell you that the city is fairly well open because they have alreadv established that fact to their own satisfaction (renewed laughter and great applause).

In conclusion on behalf of the city government, Mr. President, I welcome this association to the city of Buffalo and I trust that your stay will be a profitable one to you and an enjoyable one as well. I thank you for your attention (great applause).

PRESIDENT OLIPHANT: Gentlemen, you have all been gratified I know in hearing the honest, hearty and cordial welcome on the part of the Mayor, the City Council and the Citizenship of Buffalo just extended to us by Mr. Sweeney. I now want to introduce to you Mr. Freeman T. Eagleson of Columbus, Ohio, whom I will ask to say a few words in response to this address of welcome (more applause).

MR. FREEMAN T. EAGLESON, of Columbus, Ohio, then delivered the following:

RESPONSE TO ADDRESS OF WELCOME

Mr. President, Representative of His Honor, the Mayor of Buffalo, and Gentlemen of the Convention:

It is a genuine pleasure to be again "in Convention assembled" and to recall the events of the year that has passed since last we met in that wonderful city on the lake, Cleveland, Ohio.

The Natural Gas Association of America meets in Convention once a year for the purpose of re-dedicating itself to the great enterprise which attracts its attention. We listened with appreciation and with genuine gratitude to the hospitable words of welcome sent to us from the sick bed of his Honor,

the Mayor of Buffalo. We send to him in return our appreciation, our sympathy because of his illness and our urgent hope and wish that he may at an early date — indeed at a very early date return to fully restored health (applause).

I am not so sure having just arived a few moments ago in Buffalo that I quite comprehend what the spokesmen of this great city had in mind when he spoke of Canada and the Volstead Act (laughter); I take it though from the hearty response that some one has full information on the subject and that that information will be duly and timely disseminated (laughter and applause). If I understood those remarks — and I am a fairly good guesser because a man cannot be in the Natural Gas business very long unless he is a fairly good guesser (more laughter); literally translated his message means that we are not far distant from the great Niagara, which translated into common English means "the thunder of water" (continued laughter) and that the proper place to view that wonderful work of nature would, of course, be from the Canadian side (great applause). So I assume without the formality of a resolution it is to be generally understood and "the sense of the meeting" that we are to visit Niagara and view the world's great miracle from the side of Canada and I suppose also that means that the Committee which selected the situs of this Convention is to be congratulated, because, as I understand it, under our Constitution we must meet in annual convention "within the United States" but they were careful to select a situs not far distance from the boundary line (more applause).

Gentlemen of the Convention — and I may assure Mr. Sweeney that I speak the mind of this Convention when I say that we are happy to be back in Buffalo because this is not the first time we have come to Buffalo and the fact that we are coming here again is proof of our appreciation of Buffalo and its hospitality, because the Natural Gas man would not be a natural gas man unless he were a man of individuality. The natural gas buiness is no place for the Mollycoddle. Its business is as rigorous in its economical phases as the rigor of the climate of the north. It does not have within its circle of activity a man whose wealth came through the road bed of the velveteer.

It is the man that goes out and gambles with the caprices of nature and fights the battle of the rugged alone that survives in this enterprise.

You speak of your municipalities and their official difficulties; well, we have the greatest state in the Union, even greater than itself, just to your west, the state in which the sun sets; the State of Ohio. We have our municipal problems there. They have their difficulties with the budget system and every suggestion that Your Honor made about the official difficulties of a city; about the increased cost of material and the increased cost of labor and the impossibilities of getting either material or labor are not problems that are new to the Natural Gas man for no man knows those difficulties better than the natural gas operator.

Gentlemen, the natural gas business in this country today is appealing to the municipalities and to the communities they serve, to recognize the fundamental principles of economics and and make it possible for us to go on producing this miracle fuel to the less than ten percent of the people of the United States whose great good fortune it is to have natural gas and enjoy its benefits.

Shortage of gas in Buffalo? So says the representative of the City of Buffalo. Why that is nothing special. We suffered from a shortage of gas out in Ohio where we had the best gas companies in the United States except those which serve Buffalo, of course, and we had a marked shortage of natural gas and that there will be shortages of natural gas in the centers of responsible and reliable production of natural gas are matters of history. The tomorrow of the natural gas business will find its supply coming from the centers of less reliable production where the steel pointed drill misses the deposit that is left and where when found the production of the well is about one third on an average of what it has been in the past.

Yes, Your Honor, the natural gas deposit is not only depleting as you say but it is rapidly depleting and I say to the City of Buffalo as I say to the cities of Ohio, which I come in contact with, that there is only one solution of the difficulty and that is the heartiest and most candid co-operation between the

municipality and your gas company. The municipality that today or tomorrow takes a position antagonistic to its gas servant and fights it is doomed and is being actuated by prejudice and passion with its eyes closed to judgment and reason (applause), so that if the consumers of natural gas are to go on in this gamble for miracle fuel and get all that can be gotten from the residue that is left in the bosom of mother earth they must regard the natural gas company as their public utility, for that is what it is, and function with the enterprise and make it possible to have natural gas as long as possible (great applause).

I did not intend to go off into this discussion but the suggestion was so timely and so appropriate coming from the spokesman representing this city that I could not refrain.

I remember as I came into Buffalo this morning, and as it always comes to my mind when coming into Buffalo, that His Honor, the Mayor, of this great city, has the distinct honor of succeeding as Mayor of the city a man who years ago graced the same position which he now holds and who afterwards became a great president of the United States in his day and the history and study of his life and character adds to the fame of the man and the fame of the city he so well represented — Grover Cleveland — (great applause). He had a remarkable stability as he stood on the Ship of State with that sturdy, matchless integrity that so marked him and kept his hand firm as he guided this country safely through many of its perplexing difficulties. Would that there were more Grover Cleveland's in this country today (renewed applause). Then I have another sentiment founded upon a memory that you all have and that is that the city that honors us and that extends to us the splendidly phrased and cordial greeting of welcome and which we accept in fullest measure with the promise not to abuse the trust, is the same City of Buffalo and the one city of the United States that had the distinguished but solemn honor of holding to its bosom the tender, loving and beautiful character while the life ebbed out of the immortal William McKinley (continued applause) and so if it shall please the City of Buffalo we shall accept its hospitality for the three days to come and we shall make ourselves at home because

of these gracious words of greeting, mindful, however, of the fact that while we are here to enjoy ourselves in the happy reunion that comes on occasions of this character we must, because the task is large, not overlook the fact that our fullest preparations will not be adequate to meet the difficulties of the natural gas business during the coming year.

I see faces before me that I have seen at Conventions before; men who have given their lives to the development, production, distribution and use of natural gas and by so doing have been public benefactors, because there is no other avocation or vocation of men that contributes more to the welfare and happiness and the necessities of mankind than that association of men that penetrates the earth that produces natural gas for fuel and light, to cook the food and warm the body and in the same operation develops from the bowels of the earth the great oil products of the world without which no commerce could move. And so we are proud of our vocation, we glory in the risk. We do not envy — really, if Your Honor please, we do not envy as we go out into the mountains and the vales and the plains and invest our capital, for the only certainty in the natural gas business is the investment of capital (laughter and applause), and then if we find a dry hole as we call it the newspaper does not say anything about it (more laughter), there is not even a respectable boquet sent over as a contribution with an expression of sympathy, but if on the wheel of fortune we have found some of the product which we seek then comes along the sovereign power of the State or the United States or the Municipal Council, if you please, and they are too prone to say "We will allow you a banker's rate of interest on your investment". That will kill the natural gas business and it has hurt it immeasurably in every state in this Union and it has only been within the last year that public authority has awakened to the fact that you cannot get men to keep on in a business surrounded by such hazards by applying the principle of banking rates to it (great applause). We do not like the harness being made so tight that if we lose our gamble we get nothing — not even sympathy. If we win we are not rewarded like the man who seeks the coal vein. Yet his business is strikingly analagous to ours. We do not like to have what might be termed the velve-

teer say "you shall have our banker's rate of interest as your reward". What we want and what we must have and what the cities must have and it is a question of time how soon they shall want it (they ought to want it now) is close sympathetic full information and co-operation between the gas companies and the consumers on the subject of solving the difficult problems ahead of us in this great business (continued applause).

Now, Gentlemen of the Convention and to the Representative of the City of Buffalo, I have talked much too long for a response to an address of Welcome. I thank you as the representative of this city on behalf of the membership of this association for your cordial words of welcome. If I have omitted to say anything that I should — and I usually do — it will be understood as said because it was meant. I am sure during our stay in Buffalo we will have as we usually have that delightful, helpful association which will insure to us an enjoyable stay within your municipality.

I see sitting down here to my left one character whom I know well that I think I should mention probably at this time, as he is what might be termed the Dean of the Natural Gas business in our section of the United States, at least. I refer to that splendid character Martin B. Daly, of Cleveland, Ohio, President and General Manager of the East Ohio Gas Company (applause). Then since mentioning him, I look across in front of me and I see a man whom to know is to love; a man who has spent almost a half a century in the close concentrated study of geology, who perhaps more than any other man in the United States has tried to fathom that great interrogatory that has come down to us through the literature of the past "canst thou by searching find out God" and this beloved character for half a century has been studying the "anticlinal" theory, do you call it? We lawyers have trouble in our diction sometimes, but he has been trying to find out what God hath wrought in the evolution of this child of his that he flung into space and called "earth". Need I say I allude to that beloved pioneer of natural gas Dr. Israel C. White, of Morgantown, West Virginia (continued applause). Gentlemen, I thank you (more applause).

"Why are not these conditions explained to the public so that they will realize what the natural gas industry is up against and be given an opportunity for cooperation."

The United States Fuel Administration started a publicity campaign by means of specially prepared leaflets for use in the public schools on "Conservation", posters and others literature, to awaken the public to the fact that the natural gas resources of the country were fast being depleted and that it was imperative that immediate steps be taken to conserve the remaining supply if future generations are to enjoy the benefits of this commodity even in a restricted way for purely domestic consumption.

The United States Bureau of Mines under the very able direction of Dr. Van. H. Manning, has taken up the work started by the Fuel Administration and is rendering valuable assistance to the country and the industry by giving the aid of the Government in making exhaustive tests along various lines and calling conferences for all parties interested in order that a definite policy may be established; thus giving stability to the proposition by showing the public that the statements and claims of the natural gas industry are substantially correct. The public is to shown how its best interests can be conserved by cooperation in the elimination of waste and by the use of proper appliances, etc.

The gas industry is in duty bound to comply with all reasonable suggestions looking towards a careful survey to properly conserve production and the elimination of leakage losses, etc. This matter will be taken up more fully in the discussions and reports that will be presented by the National Committee on the Conservation of Natural Gas, which is perhaps more familiarly known as "The Committee of Ten."

Also, particular attention is called to the practical demonstration to be given during the convention under the direction of Mr. Samuel S. Wyer and domestic science experts, who have been sent here under direction of the Bureau of Mines, to show conservation by the correct use of natural gas for cooking.

Your Association has made every endeavor during the past year to keep its members thoroughly informed as to interesting developments of the industry throughout the country.

It has maintained a correspondent at Washington in order to keep in close touch with National legislation and has been instrumental in laying before the authorities certain true facts concerning our industry which were not clearly understood.

The Association has requested each company member to appoint a publicity representative and through this agency has endeavored to keep an eye on every community served with natural gas for unusual conditions.

Matters of moment have been passed on to members of the Association by means of a series of bulletins, thirty of which have been issued during the past year; over one hundred thousand sheets of printed matter have been sent out, comprising about forty thousand pieces of mail. During the past year, it has been necessary to double thc working force of the Association's office in order to handle the ever-increasing volume of business.

The executive officers of the Association have caused eighteen meetings to be held to talk over different problems of gas interest.

The Association has been represented at meetings of the United States Bureau of Standards and also the Joint Committee on Electrolysis as will be shown by reports submitted during the convention.

The Association has always placed its facilities at the disposal of the Federal Government whether in connection with the National Committee on Natural Gas Conservation in assisting different members in compiling their reports, etc., or the Bureau of Internal Revenue in arranging form and schedules for compiling data on leaseholds and other taxable holdings of gas companies and assisting the Bureau's representatives in obtaining a working knowledge of the natural gas industry.

In conclusion, I desire to express the pleasure it has given me to be associated with the active interests of the Natural Gas Association during the past year and to observe the excellent spirit of cooperation of the different committee-members, the Board of Directors and Officers.

Last, but not least, I wish to express my personal appreciation for the most excellent work performed by our Executive Secretary, Mr. William B. Way, and to state that the success of

this convention has depended upon the untiring efforts of Mr. Way and his worthy contemporary, Mr. Larmour Adams.

May I take this opportunity of thanking one and all for the loyal support given the Association during my tenure of office and to wish my successor *"more power"* in the development and usefulness of THE NATURAL GAS ASSOCIATION OF AMERICA.

After the applause had subsided following the reading of the President's Address, Mr. Krick said:

Gentlemen, you have heard a very excellent address by your worthy President and we are now ready for a motion that a Committee of three be appointed to consider the recommendations therein contained. The chair will be glad to entertain a motion of that kind at this time.

MR. L. B. DENNING: Mr. Chairman, I move that the Chair appoitn a Committee of three to constitute a Committee on the President's Address to make a report to the Convention upon the recommendations and suggestions contained therein.

MR. HENRY S. NORRIS: I second Mr. Denning's motion.

ACTING PRESIDENT KRICK: Gentlemen, you have heard the motion duly seconded that a Committee of three be appointed by the Chair constituting a Committee on the President's Address, are you ready for the question?

And thereupon the above motion having been duly seconded was unanimously adopted.

ACTING PRESIDENT KRICK: I will appoint the following:

COMMITTEE ON PRESIDENT'S ADDRESS

John H. Maxon, Muncie, Indiana.
R. W. Gallagher, Cleveland, Ohio.
G. F. Batchelor, Pittsburgh, Pennsylvania.

PRESIDENT OLIPHANT resuming the chair said:

Gentlemen, the next order of business is the report of the Board of Directors which will be made by the Secretary of our Association, Mr. William B. Way.

SECRETARY WAY then presented the following:

REPORT OF THE BOARD OF DIRECTORS

To the Natural Gas Association of America:

GENTLEMEN:

The Board of Directors held three meetings during the year and carried on the regular business of the Association and have appointed the following committees:

Committee on Place of Next Meeting:

Kay C. Krick,
E. D. Leland,
F. P. Fisher.

Committee on Nominations:

W. Y. Cartwright,
Jno. B. Corrin,
J. W. McMahon.

Committee on Memorials:

R. W. Gallagher,
L. B. Denning,
S. M. Douglass.

Committee on Final Resolutions:

T. C. Jones,
F. C. Hamilton,
Lucius S. Bigelow.

Special Finance Committee to Report on Secretary's Salary:

W. Y. Cartwright,
R. W. Gallagher,
K. C. Krick.

PRESIDENT OLIPHANT: Gentlemen, you have heard the report of the Board of Directors; do I hear a motion that the same be approved, ordered placed on file and spread upon the minutes?

MR. MARTIN B. DALY: I so move.

MR. K. C. KRICK: I second the motion.

The above motion, having been duly seconded, was then unanimously adopted.

PRESIDENT OLIPHANT: The next report in the regular order of business is the report of the Treasurer, Mr. Way.

MR. WILLIAM B. WAY, of Pittsburg, Penn., then presented the following:

TREASURER'S REPORT

NATURAL GAS ASSOCIATION OF AMERICA.

April 30, 1919 to April 30, 1920.

RECEIPTS.		*Dr.*	*Cr.*
Balance on hand, April 30th, 1920........		$14,508 71	
Dues —			
Active Members	$6,795 00		
Associate Members	22,951 53		
		29,746 53	
Interest Earnings —			
Liberty Loan Bond Int.........	414 50		
Interest on Daily Bank Balance.	327 06		
		$741 56	
Miscellaneous		224 44	
1919 Banquet —			
Cost of Banquet...............	$4,354 50		
Receipts from Banquet........	2,089 40		
	$2,265 10		$2,265 10
Items to be Collected..........	652 60		
Loss on Banquet..........	$1,612 50		
Total		$45,221 24	$2,265 10

DISBURSEMENTS.	
1919 Convention Expenses....................	$5,308 43
1920 Convention Expenses....................	1,589 55
Salaries	11,281 26
Travelling Expenses of Secretary.............	2,832 50
Expenses of Officers, Directors and Committee-men	2,233 01
Rent and Office Expenses.....................	2,293 45
Furniture and Fixtures.......................	1,147 88
Wrinkle Department, 1919.....................	795 87
Wrinkle Department, 1920.....................	12 50

Books of Proceedings		2,331 81
Telegraph		170 32
Telephone		312 23
Postage		598 41
Cash Fund, "W. B. Way"		500 00
Miscellaneous		1,203 04
Supplies, etc., in excess of reimbursements for Special Work		2,512 21
Bank Balance		7,833 67
Total	$45,221 24	$45,221 24

ASSETS.

Liberty Loan Bonds	$10,000 00
Amount due for 1919 Banquet	652 60
Amount due for Special Work	2,512 21
Cash Fund	500 00
Balance in Bank, April 30th, 1920	7,833 67
Total	$21,498 48

Yours very truly,

(Signed) WM. B. WAY,
Treasurer.

PRESIDENT OLIPHANT: Gentlemen, you have heard the Treasurer's report; what is your pleasure?

MR. T. C. JONES: Mr. President, I move that the report as read be accepted, placed on file and spread upon the minutes.

MR. JOHN H. MAXON: I second the motion.

The above motion, having been duly seconded, was then unanimously carried.

MR. HENRY S. NORRIS: Mr. President, I would like to make a motion at this time. I move that the various actions of the Board of Directors during the past year be approved at this meeting by the members present.

MR. KAY C. KRICK: I second the motion.

PRESIDENT OLIPHANT: Gentlemen, it has been moved and second that the various acts of the Board of Directors during the past year be approved; are you ready for the question?

The above motion, having been duly seconded, was then unanimously carried.

President Oliphant: The next order of business is the report of the Finance Committee of which Mr. L. B. Denning is Chairman.

Mr. Denning: Mr. President, the books and accounts of the Secretary and Treasurer and of the various officers have been audited by an accountant representing the Finance Committee; however, owing to the absence of my fellow members of the Committee, Mr. Quay and Mr. Sullivan, I am going to ask the privilege of further time, with the consent of the Convention, in which to make the report and would suggest that the submission of the report be postponed until tomorrow. I would prefer to consult with them when they arrive.

President Oliphant: All right, sir; if there is no objection the consent for postponement requested by the Chairman is granted.

The next order of business is the presentation of applications for membership by the Committee on New Members.

Mr. Henry S. Norris: Mr. President, in the absence of O. K. Shannon, Chairman of the Membership Committee, I am pleased to report two hundred and eighty applications for membership in our association (applause).

It was then moved by Mr. Henry S. Norris, duly seconded by Mr. T. C. Jones and unanimously carried amid applause, that the Secretary be directed to cast the ballot of the Association for the election to membership in the Association of the applicants recommended in the verbal report.

Secretary Way then cast the ballot of the Association for election to membership of the applicants whose names were recommended by the Committee and said applicants were duly declared members of the Association and invited to participate in all of the proceedings.

The list of applicants recommended and elected to membership in the Association is as follows:

NEW MEMBERS

Allen, J. C., Manager of Station, Ouachita Gas Co., Monroe, La.

Anderson, J. K., Consulting Engineer, Anderson and Taylor, 504-507 Coyle and Richardson Bldg., Charleston, W. Va.

Armstrong, W. A., Manager, Ingersoll-Rand Co., Cleveland, Ohio.

Ashdown, F. J., Foreman, East Ohio Gas Co., 42 Liberty Street, East Palestine, Ohio.

Assur, Samuel, Vice President, Cincinnati Gas & Electric Co., Fourth & Plum Streets, Cincinnati, Ohio.

Bair, Chas. E., 1312 Fulton Bldg., Pittsburgh, Pa.

Baird, Geo. H., Asst. Supt. of Dept. of Gas Measurement, Empire Gas & Fuel Co., Drawer F., Bartlesville, Okla.

Balcom, E. A., Field Foreman, Medina Gas Co., Vienna, Ontario.

Barbour, F. P., Right of Way Dept., Hope Natural Gas Co., Empire Bank Bldg., Clarksburg, W. Va.

Barnard, Frank B., 1110 Prudential Bldg., Buffalo, N. Y.

Batchelor, E. E., Auditor, The Natural Gas Co. of West Virginia, 323 Fourth Ave., Pittsburgh, Pa.

Bauer, W. T., Accountant, F. C. Hamilton, 60 Wall St., New York, N. Y.

Beam, Chas., Dominion Nat. Gas Co., Dunnville, Ontario.

Becker, J. A., Vice Pres. and Gen. Mgr., The Cree-Becker Oil Tool Co., Box 908, Newark, Ohio.

Benkert, Fred A., Field Clerk, Peoples Natural Gas Co., R. R. 1, Mayport, Pa.

Benninger, A. J., McCoy Natural Gas Co., Knox, Pa.

Bentley, H. G., Manager, Kane Supply Co., 17 Greens St., Kane, Pa.

Bettcher, W. F., East Ohio Gas Co., 1032 Lakeview Rd., Cleveland, O.

Black, J. J., Field Foreman, United Nat. Gas Co., Hallton, Elk Co., Pa.

Blackburn, Oscar, Teller, Union Gas & Electric Co., 7036 Fern Bank Ave., Cincinnati, Ohio.

Bockmier, Fred J., Foreman, Portland Lumber Co., Ridgway, Pa.

Boggs, G. R., Superintendent, Newark Natural Gas & Fuel Co., 58 W. Main Street, Newark, Ohio.

Bonnell, B. E., Foreman, Logan Gas Co., 29 S. Washington St., Tiffin, Ohio.

Bonnett, Frank, Engineer, The Natural Gas Company of West Virginia, 34 Garfield Ave., Salem, Ohio.

Brend, Herbert, Cashier, Dominion Natural Gas Co., Ltd., 39 Queen St. East, Galt, Ontario, Canada.

Brewster, Frank M., Assistant Foreman, Hope Nat. Gas Co., 217 Center Ave., Weston, W. Va.

Bridges, James M., Agent, United Nat. Gas Co., Liberty St., Franklin, Pa.

Brigel, Samuel G., Manager, Economy Burner & Eng'g Co., 29th St. and A. V. R. R., Pittsburgh, Pa.

Bronson, P. J., Chief Engineer, Tonkin Compressing Station, Northwestern Ohio Natural Gas Co., Van Buren, Ohio.

Browne, R. T. Jr., Salesman, Youngstown Sheet & Tube Co., 1626 Oliver Bldg., Pittsburgh, Pa.

Bruce, Robert L., Assistant Supt., E. M. Treat & Co., Box 262, Strawn, Texas.

Brumage, P. H., Hope Natural Gas Co., 415 Franklin St., Mannington, W. Va.

Brundale, B. M., Agent, The Texas Co., Baird, Texas.

Brunner, James K., Manager, Pittsburgh Branch Macomber White, 424 First Ave., Pittsburgh, Pa.

Burgess, Ross, Dist. Foreman, Carnegie Nat. Gas Co., Folsom, W. Va.

Burwell, Anson C., Designing Engineer, United Natural Gas Co., 308 Seneca St., Oil City, Pa.

Cain, E. L., Foreman, The East Ohio Gas Co., Orrville, Ohio.

Caldwell, C. H., Secretary-Treasurer, Indian Territory Illuminating Oil Co., Osage-Producers Gas Co., Drawer L, Bartlesville, Okla.

Chuck, Joseph E., Clerk, Columbia Gas & Electric Co., 21 East 77th St., Carthage, Cincinnati, Ohio.

Clay, Paul E., Meter Man, Arkansas Nat'l Gas Co., Ward Bldg., Shreveport, La.

Clowes, Chas. R., Salesman, Pittsburgh Gage & Supply Co., 3000 Liberty Ave., Pittsburgh, Pa.

Cobb, D. L., Secty-Treas. Lone Star Gas Co., Dallas, Texas.

Conon, Walter R., Supt. Gas Division, Union Oil Co., of Cal., Room 936 Union Oil Bldg., Los Angeles, Cal.

Coogle, J. M., Salesman, New Martinsville Supply Co., New Martinsville, W. Va.

Cooper, Ben S., Land Department, The Natural Gas Company of West Virginia, 323 Fourth Ave., Pittsburgh, Pa.

Coste, E. Frank, Assistant General Supt., The Canadian Western Natural Gas Light, Heat & Power Company, Ltd., 215 Sixth Ave., W. Calgary, Alberta, Canada.

Crouse, Geo. C., Abstractor, Hope Natural Gas Co., West Union, West Va.

Crowe, E. L., Engineer, The Koppers Co., Union Arcade, Pittsburgh, Pa.

Cude, H. E., Chemist, Mfgrs. Heat & Light Co., 1417 Chapline St., Wheeling, W. Va.

Cummins, C. L., Pres. and Gen. Manager, Cummins Engine Co., 7th and Jackson, Columbus, Ind.

Curry, Elliott, Foreman, Penna. Gas Co., Leeper, Pa.

Dailey, Benjamin S., Local Manager, Warren and Chautaqua Gas Co., 236 Pennsylvania Ave., West Warren, Pa.

Davis, Merrill N., Special Representative, S. R. Dresser Mfg. Co., Boyleston St., Bradford, Pa.

Delaney, Daniel, Superintendent of Meter Department, Peoples Natural Gas Co., 2920 West Liberty Ave., Dormont, Pa.

Denman, Edgar, Manager, John Denman & Son, Lancaster, O.

Derwent, Watson E., Vice Pres., Geo. D. Roper Corp., Rockford, Ill.

Dickinson, B. J., Auditor, Ouachita Nat. Gas & Oil Co., Monroe, La.

Diehl, John C., Engineer, 644 W. 11th St., Erie, Pa.

Douglass, E. A., Manager, Horace G. Preston Co., 238 Fourth Ave., Rooms 403 and 404, Pittsburgh, Pa.

Dove, A. Earl, Local Mgr., Logan Natural Gas & Fuel Co., Utica, Ohio.

Duffy, Thos., Foreman, United Nat. Gas Co., 52 S. Oakland Ave., Sharon, Pa.

Dunnington, F. D., Superintendent, West Virginia Central Gas Co., Philippi, W. Va.

Dupree, Fred, Manager Station, Ouachita Gas Co., Monroe, La.

Eastman, C. C., Superintendent, Manufacturers Gas Co., 42 South St., Ridgway, Pa.

Eister, Howard, Salesman, Diamond Supply Co., 910 Quarrier St., Charleston, W. Va.

Elder, John D. P., Producer, Amber Co., Junction City, Ohio.

Elliott, Amos W., Assistant to Manager, California Natural Gas & Oil Co., 915 First National Bank Bldg., San Francisco, Calif.

Ennis, P. J., Superintendent, West Virginia & Maryland Gas Co., Lonaconing, Maryland.

Evans, H. S., Assistant to President, The Natural Gas Co., of West Virginia, 323 Fourth Ave., Pittsburgh, Pa.

Ewing, A. M., Meterman, Southwestern Gas Co., Elk City, Kansas.

Fahey, J. T., Leakage Dept. United Natural Gas Co., Seneca St., Oil City, Pa.

Faith, H. E., Chief Engineer, Hope Natural Gas Co., Hastings, W. Va.

Fenwick, W. A., Sales Agent, Fenwick-Reddaway Mfg. Co., Newark, N. J.

Ferguson, Geo. L., Cashier, Athens Gas, Lt. & Elec. Co., S. Court St., Athens, Ohio.

Fisher, Mrs. Luella, Demonstrator of Economical Use of Gas, East Ohio Gas Co., 213 E. Grant St., Alliance, Ohio.

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President Oliphant; Gentlemen, we will now have the pleasure of listening to a paper by Mr. W. I. Moyer of the Philadelphia Company on the subject "Present Known Eastern Gas Fields and Their Probable Life". I take great pleasure in introducing to you Mr. Moyer (applause).

Mr. W. I. Moyer: Mr. President, Members of the Association and Guests: The nature of my paper is rather technical and I have necessarily had to put in a lot of statistics and other information of special rather than general interest and so with your kind permission I will eliminate certain parts of the paper which can hardly be of interest in a general way and of course as you all have copies of the paper you can read it in its entirety at your leisure if you desire to do so.

Mr. Moyer then presented the following paper:

THE NATURAL GAS FIELDS OF EASTERN UNITED STATES AND THEIR PROBABLE FUTURE LIFE

By W. Irwin Moyer.

The natural gas fields of eastern United States lie almost wholly in what is known as the Appalachian geosyncline, a great trough-like depression paralleling the Appalachian mountains on the west and extending in a northeast-southwest direction from New York state through Pennsylvania, West Virginia, Kentucky and Tennessee.

The series of shales, sandstones, clays, coals and limestones which go to make up the rocks of the Appalachian oil and gas fields were laid down in an Interior Sea formed in the latter part of the Cambrian period, the earliest period of the earth's history of which we have definite geologic knowledge. This Interior Sea covered all of the Mississippi valley and extended east to beyond the eastern flank of the present Appalachian mountains. With frequent fluctuations both as to depth and form it continued to cover most of this area until mid-Carboniferous time, after which, deposition largely continental, continued into the Permian period, many millions of years later. During this time were deposited all the rocks which we now associate with petroleum and natural gas in the Appalachian fields.

The mass of sediments formed during this time was gently folded and as the weight of the overburden increased the folds increased; this folding was accomplished very gradually and with little alteration in the attitude of the rocks, except that the syncline or trough was becoming more pronounced and the lower strata sinking gradually deeper. Due to this compression and folding, the gas and oil formed in the rocks began to accumulate, seeking the higher and more suitably porous parts of the sandstone horizons into which they had migrated.

At the close of the Permian period a very violent disturbance took place. Due to increasing lateral compression the Appalachian mountains were pushed up, and the strata overlying and

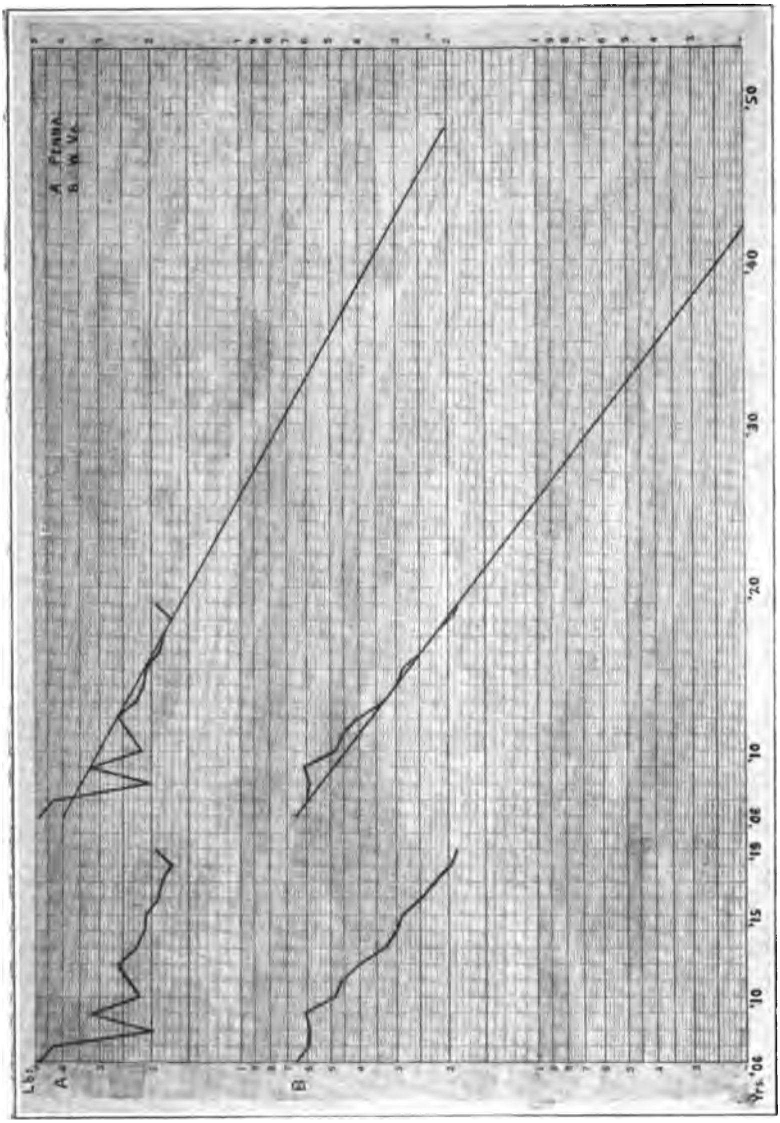
adjoining them were violently folded or broken by faults. The mountains were originally of great height, probably higher than the Rocky mountains as they are today. The effect of this upheaval, while more noticeable in the vicinity of the mountains, extended for many miles, and as far west as central Ohio folding took place.

It is important to observe that while this later series of folds would naturally tend to accentuate folds already present there is no reason why this should be universal. Had the later folding exactly coincided with the earlier folding, surface structure would be exactly coincident with subsurface structure. In many cases, fortunately, they are coincident, especially in the case of the larger folds. But the accumulation of oil and gas took place long before the close of the Permian, and it is an uncertain question as to what degree this early accumulation was altered by the late Permian disturbance. Hence the careful operator in the eastern fields will do well to study his well logs, for in them, as much as in the surface structure, lies the key to the attitude of the producing horizon.

The syncline is deepest in West Virginia and western Pennsylvania, and more shallow toward the west and north. Hence in West Virginia and southwestern Pennsylvania petroleum and natural gas are derived from younger formations: Devonian and Carboniferous; while in New York, Ohio and Indiana, where the older formations are nearer the surface, oil and gas are found in such horizons as the Trenton limestone of the Ordovician and the Medina and Clinton sandstones of the Silurian, formations which have been beyond the reach of the drill in western Pennsylvania and West Virginia.

NEW YORK

In New York natural gas is produced commercially in the southwestern and west-central parts of the state, in small isolated fields. The fields of importance can be encompassed in a broad oval, the long axis of which extends from Oswego County on the northwest to Chautauqua County on the southwest, embracing seventeen counties.



TYPICAL ROCK PRESSURE DECLINE OF PENNSYLVANIA AND WEST VIRGINIA.

New York is a gas consuming rather than a producing state. It has always consumed much more than it produced. During 1916 and 1917 nearly three times the amount of gas has been consumed within the boundaries of the state as was produced, and the ratio has doubtless been maintained up to the present time. During 1917, the last year for which data is as yet available, 8-1/3 billion cu. ft. were produced within the state, while the consumption was 22½ billion cu. ft., the difference being supplied from the fields of northern Pennsylvania.

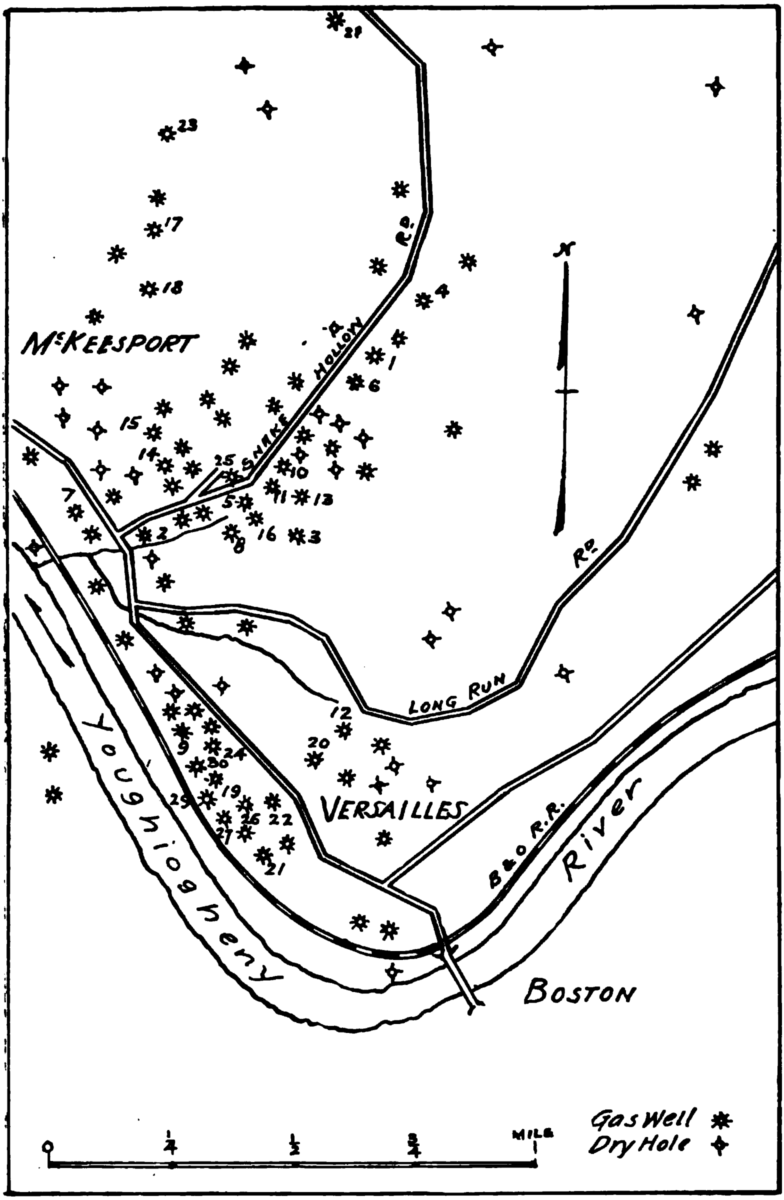
The largest quantity of gas comes from the Medina sand of the Silurian system, an unusually persistent producer. The accumulation of gas is in small fields, erratic and without definite trend. Porosity of the sand seems to be the determining element in the accumulation.

There is a small amount of production from the Trenton limestone in the central part of the state, in Oswego County. In Cattaraugus, Allegany and Steuben Counties, where the oil fields overlap with those of northern Pennsylvania, gas is found in good volume in connection with petroleum in the Chemung and Portage groups of the Devonian system.

PENNSYLVANIA—WEST VIRGINIA

The natural gas fields of Pennsylvania and West Virginia extend in a broad belt from McKean and Potter Counties in northern Pennsylvania to Wayne County, western West Virginia, the trend of the belt of production following the northeast-southwest direction of the Appalachian mountains. The distribution of the gas fields is much the same as that of the oil fields of the two states, with the exception that gas extends a few miles further east, and nearer the mountains, than oil. This is as might be expected, as with increased pressure, due to the uplift of the mountains, the heavier hydrocarbons have been replaced by gas.

In Pennsylvania, twenty-three counties produce gas in commercial quantities; in West Virginia thirty-two counties in the northern and western parts of the state are productive. The producing horizons are universally sandstones, with but one ex-



THE McKEESPORT GAS FIELD.

ception, that of the small amount of gas produced from the Pittsburgh coal.

I imagine practically everyone in this audience is already familiar with the well-known sands of Pennsylvania and West Virginia, and I shall not detail them here. They extend all the way from the Murphy sand, 150 or 200 below the Pittsburgh coal to the Kane sand, productive in northwestern Pennsylvania, about 3800 feet below the Pittsburgh coal. The best of these are found in the Pocono series of the Mississippian and the Catskill and Chemung series of the Devonian. While a larger number of possibly productive sands are present in these two states than in any other oil or gas district in the world, it is seldom that more than two or three of them are commercially productive in any one locality.

Since 1909 West Virginia has produced more gas annually than any other state in the Union. Its production has steadily increased from 119 billion cu.ft. in 1906 to 308 billion cu. ft. in 1917. This supply cannot much longer be maintained unless some new large sources are opened up. The rock pressures of the state are declining rapidly, and the day of ultimate exhaustion of the present fields looms dangerously near.

Of approximately 250 wells, producing from various sands in nearly all productive districts of the state of West Virginia, the average rock pressure in 1910 was 479 pounds. This pressure has fallen off rapidly, until in 1919 a similar average of nearly all the producing sands in the state shows 186 pounds, or a decline of 293 pounds during a period of 9 years. While this very rapid decline does presage an approaching exhaustion of the productive sands, the nature of rock pressure decline is such that high pressures are accompanied by rapid decline; which does not necessarily imply equally rapid decline when the pressures have become low. But the present great output of the state cannot be maintained much longer with these rapidly declining pressures. Either the output must decrease or the sands will be pumped to exhaustion within a few years. The nature of this decline will be discussed a little later, as a basis for some conclusion as to what steps may be necessary to safeguard the supply.

Up to 1910 Pennsylvania produced the maximum quantity of gas of any state in the Union; in that year it yielded to West Virginia. In Pennsylvania the peak of production was reached in 1909, when the state produced 166 billion cu. ft. The rock pressures of Pennsylvania sands are lower than those of West Virginia, and the decline has been less precipitous.

OHIO — INDIANA

The principal production in Ohio comes from the "Central Ohio Gas Belt", a strip of land ten to thirty miles in width extending through the center of the state from Lake Erie just west of Cleveland, to the southern part of Vinton County, in south-central Ohio. The production is from the Clinton sand, now considered to be Medina in age, of the Silurian system.

The Trenton limestone and the Medina sandstone, were deposited in the Interior Sea which covered all of the Mississippi basin during the Ordovician and Silurian periods; the Trenton being an Ordovician horizon, and the Medina a Silurian formation. At the close of the Ordovician period there was forced up, by lateral compression, a low broad arch, known as the Cincinnati anticline or uplift. The axis of this anticline runs northeast-southwest through southern Ohio, central Kentucky and central Tennessee.

This distrubance, altering as it did, the attitude of all the sedimentary rocks, is responsible for present distribution of oil and gas in both Ohio and Indiana. In Ohio the productive districts lie on the eastern flank of the uplift; in Indiana the oil and gas fields are along its northern and western slopes. The higher parts of this uplift remained as islands above the sea through the rest of the Paleozoic era, growing constantly in size until the close of the Paleozoic era, when the Interior Sea had permanently disappeared.

The Clinton, having been deposited upon the already turned-up Ordovician rocks, is almost flat. Its very gentle eastern dip is broken by slight folds. These structures are not prominent, and the porosity of the sand seems to have been of greater importance in the accumulation of petroleum and natural gas. The

sandstone reservoirs show more than usual irregularity, due to an originally irregular shore-line, or uneven advance of the sea.

In about twenty-five counties in the eastern and southeastern parts of Ohio, gas in good quantity is found in connection with oil. The production here comes from several upper sands, such as the Salt sand and the Berea, as well as the Clinton. In the northeastern corner of the state there is small production from the Ohio black shales.

Ohio reached the peak of her production in 1915 when 79 billion cu. ft. of gas were produced. It has since fallen off about 12% and the possibility of reviving it depends upon either an extension of the Clinton production eastward, or production from the deeper Trenton limestone, underlying the southeastern fields at a depth of about 5000 feet. The first possibility, an eastward extension, seems at this time, to be remote. East of the present producing territory the Clinton sand increases rapidly in depth; a dozen counties in this area, from Lake Erie to the Ohio River have been tested, and the results are almost negligible. The next few years will no doubt see this end of the state most thoroughly prospected for deep sand production. Regarding the second possibility, that of production from the underlying Trenton, several tests have been made to that formation but without success. Indeed if we may judge from samples of the limestone found in such tests, the prospects do not appear encouraging. Oil and gas exists in the Trenton by reason of its dolomitization through the increased pore space this chemical action creates. In central and eastern Ohio the dolomitization has not reached nearly the same stage as in the Trenton of Indiana. The magnesium carbonate content of such Ohio Trenton averages from 3.9% up to 5%, whereas in Indiana the magnesium carbonate runs from 25% up to as high as 45%. Hence in central and eastern Ohio there is less dolomitization, less porosity, and less opportunity for the limestone to afford a resting place for gas or oil.

Natural gas in Indiana is found in association with petroleum; gas wells as such are now seldom drilled; when gas is found it is generally from an expected oil well. The main producing areas are in the eastern-central part of the state, the Lima Indiana field. The production comes from the Trenton lime-

stone at from 1000 to 1500 feet from the surface. The Trenton is not only the oldest formation in the world productive, to any great extent of oil or gas, but was also the first limestone to produce these minerals. In northwestern Ohio it is more than 780 feet in thickness; in southwestern Ohio it is 650 feet thick. However, production is found only in the upper part of the lime, a little over 100 feet, which is more highly dolomitized than the remaining thickness.

The gas fields of Indiana are already in their last stages of exhaustion, and their ultimate extinction is a matter of only a few years.

KENTUCKY

The natural gas industry of Kentucky is a by-product of the oil industry, and the discoveries of all the gas fields have resulted from the search for oil. Gas is found in the eastern end of the state, in Menifee, Powell, Floyd, Knott, Johnson, Magoffin and Martin Counties; also in connection with oil in the Big Sinking pool in Lee County, the Irvine pool in Estil County, and the oil pools of Allen County. Production is mainly from the Corniferous, of the Onondaga series, a limestone carrying much silica; from the Berea above and the Niagara series below. The petroleum resources of Kentucky yet remain to be fully discovered, and the natural gas industry of the state will develop as its oil pools are defined.

THE MCKEESPORT GAS FIELD

During the past year we have had an interesting example of the revival of an old and apparently exhausted field by the completion of a well to a deeper sand. In the case of McKeesport the well which opened up the field was an exceedingly large one, 58,000,000 cu. ft., about as large a well as the industry ever records. It came in the very heart of a great industrial center where much natural gas was consumed, both industrial and domestic. The market was close at hand; large lines were already close to the field and the gas would readily be purchased at a good price. No one company or group held a monopoly of the acreage; most of it was under lease at the time the dis-

covery well came in. Much of the field was cut up into small town lots, and anyone could lease somebody's backyard and go into the gas business. This combination of favorable and unfavorable elements resulted in a stampede for natural gas; the squandering of much money, and the drilling of wells so close that the landscape was a forest of derricks. Oil fields have been developed by closer drilling, but no gas field was ever developed so extravagantly. In early March of this year the field resembled Cushing or Burkburnett in their busiest days, and drilling was even closer than in the Cleveland gas field, for at McKeesport all operations were contracted into a much smaller area.

The McKeesport-Versailles or Snake Hollow field lies on the southwestern end of the Murraysville anticline, a structure well known to Pennsylvania operators for many years. Murraysville, in Westmoreland County, Pennsylvania, ten miles northeast of McKeesport, was one of the earliest districts to be developed for natural gas. In 1883 a line was laid from Murraysville into Pittsburgh, to supply the industries in that city, and this accomplishment is often quoted as one of the first landmarks in natural gas history. For thirty-five years the area between Murraysville and McKeesport, and far beyond was prospected, and an enormous quantity of gas produced. The productive sands were the Murraysville, Hundred-Foot, Thirty-Foot, Fifth, Sixth and Speechley. Northeast of McKeesport the Speechley sand had already been tested in many places, with a greater percentage of dry holes than productive wells. The nearest production to McKeesport from the Speechley sand prior to the development of last year was at the McClure Plan, just northeast of the city, where a small field was discovered in 1917; it was soon defined and drilled up, the decline being very rapid.

While it is generally believed that Foster's big well was the discovery well in the field, it is a fact that this well was the third and not the first to find production from the Speechley, in this area.

On April 9, 1919, the Philadelphia Company completed a well at 2993 feet in the Speechley sand on the Storch farm in Snake Hollow, McKeesport, with an initial open flow of 339 M. cu. ft. This relatively small well created little notice; but while

the production was small, the rock pressure was enormous. The well upon completion gauged 1150 pounds after ten hours shut-in. It was not possible to measure the true rock pressure (probably over 1500 pounds) as the accumulation of pressure after this length of time began to lift the casing.

Four months later, on August 2, 1919, Dave Foster et al drilled on the Wiggins lease to the Speechley sand to a depth of 2849 feet, the well making 2,000,000 cu. ft. open flow. This well created considerable local interest, but it was not until Foster's second well came in, a month later, that the drilling campaign started which has not yet ceased.

On August 30, 1919, Foster completed No. 3 on the Hamilton lot, at the lower end of Snake Hollow, which came in with an open flow of 58,000,000 cu. ft. in the Speechley sand at 2900 feet. The news of this discovery quickly spread to every oil and gas center in the country, and leasers, scouts, drillers and promoters flocked into McKeesport, which was due to receive the greatest gas boom that settled Pennsylvania has witnessed in many years.

The field was a town lot development in the literal sense. Most of the leases were quite small, averaging less than ten acres. Many of the farms had been previously divided into plan lots for residence sites, and these were greedily picked up, locations made and wells started. The usual local interest was manifest, and local capital backed most of the wells. Fully 90% of the wells have been drilled by newly formed local organizations. A number of highly capitalized companies have been formed, and their stock seems to have been successfully floated. The older natural gas companies operating in the Pittsburgh district have, for the most part, been content to purchase the gas rather than drill for it.

In spite of the rapid decline in rock pressure which set in immediately, many large wells have been completed since that time. Foster and his associates were rewarded with five more wells which averaged 9 to 18 million cu. ft. initial. Up to April 17th, 1920, eight wells have been completed with an initial daily open flow of 10 million or better; thirteen wells with an initial open flow of 5 to 10 million, and seventy-seven more with an

initial open flow of from 5 million down to a few thousand. This data refers only to completions in the Speechley sand. Several wells have found good production from an upper sand and have not yet been drilled through. Out of 98 completions in the Speechley sand, to the above date, 56 have been producers and 42 dry holes. This is a ratio of 57% successful wells to 43% failures.

The following is a table of the larger wells, the numbers referring to the map on the field.

Well No.	*Date Completed*	*Owner*	*Farm*	*Reputed Initial Open Flow*
1	4-19-19	Philadelphia Co.	Storch	339,000
2	8- 2-19	Foster	Wiggins	2,000,000
3	8-30-19	Foster	Hamilton	58,000,000
4	10-10-19	Philadelphia Co.	Adams	1,098,000
5	10-19-19	Foster	Peterson	15,000,000
6	11- 7-19	Russell O. & G. Co.	Smith	3,700,000
7	11-25-19	Philadelphia Co.	Wiggins	5,500,000
	During Week Ending			
8	12- 6-19	Pitts	Peterson	10,000,000
9	12-13-19	Foster	Stone House	9,000,000
10	12-20-19	Lamp Brothers	Peterson	5,000,000
11	12-27-19	Versailles O. & G.	Graff	9,000,000
12	1- 3-20	Etna Fdry Co.	Lot	2,000,000
13	1-17-20	Foster	Imphernay	18,000,000
14	1-29-20	Philadelphia Co.	Greenwalt	8,600,000
15	2- 6-20	Braddock D. Co.	Wiggins	4,000,000
16	2-21-20	Foster	Hamilton	10,000,000
17	3-20-20	Foster	Fisher	18,000,000
18	3-20-20	Grandview O. & G.	Pratt	10,000,000
19	3-27-20	Howard Co.	Lot	8,000,000
20	3-27-20	McKeesport O. & G.	Rhodes	5,000,000
21	4-10-20	Egan & Ward	Lot	10,000,000
22	4-10-20	Keystone O. & G.	Marsh	9,000,000
23	4-10-20	Valley View	Young	9,000,000
24	4-10-20	MacWalt	McGee	8,000,000
25	4-17-20	Mon-Yough	Schmidt	9,000,000
26	4-17-20	Marks	Price	8,000,000
27	4-17-20	Bissell	Lot	6,000,000
28	4-17-20	Shehan	Shehan	4,000,000
29	4-17-20	Universal	Lot	4,000,000
30	4-17-20	Vers.-Greenock	Lot	3,000,000

At the present time, the rock pressure of the field averages probably about 100 pounds. It is impossible to do more than estimate the rock pressure; obviously the true rock pressure of wells so closely spaced cannot be ascertained through the difficulty

of shutting in the wells simultaneously. On April 24, 1920, the Philadelphia Company's Storch No. 1, which a year ago gauged 1150 pounds in 10 hours, showed 29 pounds after one hour shut-in. The Philadelphia Company's well on the Greenwalt lease, which came in on January of this year at an open flow of 8,600,000 cu. ft., gauged 51 pounds after one hour shut-in. Foster's well on the Peterson lease, whose initial open flow in October, 1919, was 15 million, and which when turned into the line, tore open the pipe and blew up a brick house, was on April 24, 1920, down to 43 pounds after one hour shut-in. The average shut-in pressure, after one hour, of fifteen scattered wells showed 71 pounds, at the above date. Although the apex of the interest in the development has been reached and passed, there are still two hundred wells drilling, with an additional hundred locations.

The most characteristic feature of the Speechley sand at McKeesport is its lack of uniformity in production. The reservoirs are not persistent and follow no definite trend. Proximity to production is little criterion of value. A dry hole was drilled on the Kalkbrenner lease not over 800 feet from the Foster 58,000,000 cu. ft. well. A well drilled by Fisher et al., on the Sillview plan of lots was situated directly between two large producers, the Braddock Drilling Company's well being 300 feet to the east, and the Philadelphia Company's well on the Wiggins lot 500 feet to the west, and yet the Fisher well proved to be a duster. Numerous other examples could be cited. A glance at the sketch of the field shows this spotted character of the sand, the dry holes clustering in among the largest producers.

McKeesport is a good example of needlessly close drilling. Fully twenty times the amount of money has been spent in developing the field as was necessary, as is generally the case when the exploitation of a natural resource become the vehicle for promotion of certain classes of stock which wise investors do not patronize. Some of the companies, indeed, have been well conducted, and have paid handsome dividends. The field, as a whole, however, has been greatly overdrilled, and with new wells reaching the sand every day and with rapidly declining pressures, the delivery into the lines has now so declined that pumping stations will have to be installed.

THE RESERVES OF NATURAL GAS

Natural gas is a depletable mineral; like coal, oil, copper, iron ore and other minerals, every cubic foot removed from the ground means that much lost for all time. It can never be replaced. Untold ages have been necessary for nature to store up the supply of products of decomposition or alteration of animal and vegetable matter that we now burn as natural gas. Once this supply is exhausted it cannot be renewed.

These things indeed, we all know; it may seem useless to state them here. The more we repeat them, however, and the more we get other people to think of them, especially that great body of people who never concern themselves with the source or supply of the cheap fuel they burn, are we likely to postpone that time when these reserves of gas shall cease to exist and when we shall be obliged to depend upon a manufactured product, much more expensive and much less efficient.

At what future time the available natural gas will be exhausted is, of course, a matter that no one can predict with accuracy. The best we can do is to estimate the probable decline in supply, basing our prediction upon what has taken place in the past. The same laws which have governed the supply in the past will determine the supply for the future, but a multitude of counteracting elements enter into the decline of any field, elements which we can neither control nor predict. Hence any estimation as to the future life of a well, a field, or a state, is only an approximation, subject to a wide range of error.

A study has been made of the decline in pressures of the two states, Pennsylvania and West Virginia, collectively. The data used were the records of rock pressures for the past fourteen years of approximately 2,500 wells of various companies producing from all sands in nearly all productive districts of the two states, except northern Pennsylvania. This decline may then be said to be fairly typical of southwestern Pennsylvania and West Virginia.

The average rock pressure of all wells for each year from 1906 to 1919, inclusive, was plotted on semi-logarithmically ruled paper to observe the ratio of decline. This ruling has the quality

of converting a uniformly proportionate increase or decrease into a straight line. Thus, if a well with an initial pressure of 500 pounds should fall off uniformly at the rate of 10% decrease per year until exhaustion, the decline in pressure would become a straight line on semi-logarithmic paper. The result of the study of the two states shows that West Virginia has fallen off in almost the same ratio each year for the past fourteen years and Pennsylvania to a lesser degree, the direction of decline, however, being quite evident. If an extension of this rate of decline be drawn into the future, we find West Virginia reaching a rock pressure of 20 pounds in 1942 and Pennsylvania reaching the same pressure in 1948 (see illustration on page 4.) This means that if Pennsylvania and West Virginia decline at the same rate in the future as they have done in the past their average rock pressure ill reach 20 pounds at the above years, respectively. There is no good reason for presuming the decline will be at a uniform rate in the future except that it has been so in the past in the case of West Virginia, and nearly so in the case of Pennsylvania, and as we can gauge the future only by the past it would seem not improbable that an equal rate of decline should be maintained. But it is important to observe that this decline has been maintained by drawing upon the fields very heavily, as they have been drawn upon in the past few years. Now, there will come a time very soon, if it is not already at hand, when one of two things will certainly happen: either the present demand will not be met, or the demand will be met but the rate of removal of the gas will be much faster. The demand upon natural gas will never be less than it is today while the fuel lasts, so it seems certain that the rate of removal will have to be speeded up if even the present demand is to be supplied. Such a couse points unmistakably to rapid exhaustion of the fields.

If the present demand is to be met and the present rate of decline is not to be exceeded, every company will have to make it their policy to use every possible means to discover new fields or open new reservoirs in old fields. Under the present rate for gas this policy is both difficult and dangerous, for the reason that a commodity which brings a low percentage of income does not permit a high percentage of speculation.

During the next ten years, three things will surely happen, unless all the signs heretofore dependable should fail.

First—There will be an acute shortage of gas, most acute when gas is most needed.

Second—An increase in the price of gas, such as few commodities have ever experienced in the past.

Third—A campaign of drilling, not only to discover new fields but to re-drill the old ones where the gas has not been entirely removed.

The shortage will likely come first, the increase next and the activity next. The shortage might be avoided for several years, possibly a decade, if a substantial increase could be had immediately, such as to permit profitable drilling activity on a large scale where there is only a fair chance of success. Such an increase would, of course, incidentally reduce some of the demand and prevent much of the present waste of the fuel, thus contributing, in more ways than one, toward its term of use. But until that time we shall be obliged to depend upon private speculation to do much of the sheer wild-catting which must be done sooner or later, and private speculation will not likely do so in a conservative manner. Such activity, not only toward extension of the present fields and discovery of new ones, but also in the drilling in old fields of many leases which have never had a well, seems to be the only possible remedy for the shortage which otherwise will come soon, so soon indeed that it may now be at our very door.

DISCUSSION

The reading of the above paper was heartily applauded, after which President Oliphant said: Gentlemen, you have heard a most able and interesting paper. As it is now half past twelve by Buffalo time and the time that lunch is served, I suggest that we do not discuss this paper until after luncheon. I have some announcements, however, to make before the adjournment is taken for luncheon.

The Fifteenth Annual Dinner of the Natural Gas Association of America will be held in Elmwood Music Hall tomorrow, Wednesday Evening at seven o'clock. The tickets are now on

sale at the registration booth. Luncheon is now ready to be served on the floor just immediately below. It is free to all members wearing badges, and all guests wearing badges. Immediately after our noon recess Mr. Way, our Secretary, has asked me to announce that the Association of Natural Gas Supply Men will hold its annual meeting. We will now recess until 1:30 o'clock.

FIRST DAY — AFTERNOON SESSION

TUESDAY, May 18, 1920.

PRESIDENT OLIPHANT: Gentlemen, we will now reconvene and proceed to a discussion of Mr. Moyer's very able paper. In opening the discussion I would like to ask if Dr. I. C. White, whom we all know and revere would not favor us with a few remarks on this important subject (applause).

DR. I. C. WHITE: Among the numerous geological horizons that have been mentioned in the books and by various writers there is a new horizon which has been found recently which is not mentioned by the writer of the paper in his very able discussion of the subject. It has been recently found by The Peoples Natural Gas Company of Pittsburgh, which as you all know is one of the subsidiaries along with the Hope Natural Gas Company that the Supreme Court of the United States by its order of dissolution of the Standard of New Jersey permitted what was left of that company to retain.

The Peoples Natural Gas Company, of wihch Mr. J. B. Tonkin is vice-president and general manager, drilled at a location that I made for them on Chestnut Ridge half way between Latrobe and Ligonier in a deep gorge cut by Loyalhanna Creek across the Chestnut Ridge anticlinal. The well is situated on a very large arch — in fact it is the beginning of the Alleghany Mountain system and is one of the largest arches as we come west from the main folds of the Allegheny Mountains. Instead of having to drill a thousand feet or two thousand feet to the top of "Big Injun" sand, the latter is there lifted into the air 400 feet above the well mouth or about that and recently within the last month or two they have succeeded in drilling to the Oriskany Sand. This is a formation that was named from Oriskany

Falls, N. Y., some 80 or 90 years ago. It is from ten to twenty feet thick in New York and makes a fall from which it was named by the first Geological Survey of New York as the Oriskany Sandstone. It was drilled through in the well which Mr. John G. Pew drilled for the same company some five or six years ago near McDonald, Pennsylvania, where it had a thickness of over two hundred feet. It is the same sand as one that furnishes the glass sand along the Juanita River at Mapleton, Pennsylvania and many other places along the main line of the Pennsylvania Railway. It furnishes practically all of the higher grade of glass sand to the factories in Morgantown, West Virginia, where I live, and it is obtained mostly from the Berkeley Springs region of Morgan County. So that it is a well known geological formation but has never yielded oil or gas before, principally because it had not been drilled to at the localities where it has considerable thickness. It is possible that this horizon is the real productive zone in the Irvine field of Kentucky instead of the Corniferous Limestone, the supposed oil horizon which lies immediately on top of the Oriskany Sand.

The Peoples Company have drilled recently between Latrobe and Ligonier in Westmoreland County, at the location mentioned above where Ligonier Creek cuts a gash through Chestnut Ridge about 1200 feet deep, the deepest gas well in the world, towit 6,822 feet.

In my first article written on the subject of natural gas back in that famous publication that appeared in "Science" thirty-five years ago, in which I announced the anticlinal theory of oil and gas, it was stated as my belief that where a very great thickness of shale exists the fissures that usually traverse all rocks in mountain regions would not go directly downward through the shale but that they would side step and where one left off another would start in and so on down. Therefore, they might possibly so shingle over each other like clapboards on a roof as to prevent the escape to the surface of deep reservoir gases, thus permitting commercial gas to be found at great depths even in mountainous regions. This is the first opportunity that these gas companies have had to test out the theory under good geological conditions. Referring to the other deep wells that were drilled,

one was by Mr. Pew of the Peoples Company on the Geary farm, near McDonald, Pennsylvania. It was not located by me. It was drilled to 7,248 feet. I never would have made a location for a deep well there. The same may be said of Goff well in Harrison county. I was not consulted on its location although I advised the Hope Company afterwards as to what formations they were encountering. Neither did I locate the Lake well in Marion County, West Virginia, the deepest well in the world (7579 feet), eleven miles northeast of the Goff well (drilled to a depth of 7,386 feet). Mr. J. B. Corrin succeeded in going to 7,579 feet in the Lake well where it was lost by caving shales still 600 feet above this Oriskany Sandstone. I did not make either of these locations. I never would have made them where they were because I knew the Clinton and Oriskany sands would lie very deep below the surface at the localities in question, where even at the Lake well, the Big Injun instead of being four hundred feet above was six hundred and seventy-nine feet down below the surface.

This well between Latrobe and Ligonier has only touched the top of the sand and drilled about half a foot into it. If the sand proves as thick as it did in the Geary well there is no telling what kind of a well they may yet find. When first drilled into about one half foot it started off at three hundred thousand cubic feet daily. They drilled a few inches more and it seemed to increase. The main pipe line was two miles away so they shut down the well to lay a branch line out to the main pipe line. That was soon accomplished and when the well was tested again it had increased to eight hundred thousand cubic feet and was only half a foot in the sand. They have had a little trouble since then with the caving shales above. They had put in 6141 feet of six and five-eighth inch casing, the longest string of that size of any well in the world. There was such a great length of casing that the drilling was delayed several weeks while they strengthened the casing at the upper end of the same by making 1000 feet of "upset" casing, practically doubling the strength at the joints so as to carry this great weight that hangs below. After they had put this in they found six hundred feet more of shale so that they have had a little trouble with the well and the jars

got caught and at the last account I had about a week ago they had not recovered the tools. They were apparently loose but something impinged there which prevents their withdrawal so that they had a special tool made with which they hope to dislodge the fragments of shale which are holding the jars in the well and then they intend to put in a liner to shut off this caving shale, the Marcellus Black Shale as it is known, which also gets its name from a locality in New York. Many of the geological names are taken from regions or localities in New York because that was one of the first geological surveys of the country so that these names such as Clinton, Medina, Oriskany, Niagara, Hilderbarg, Chemung, Catskill and a great many others were named from points in this great state, by the first geological survey of New York. In this development which the Peoples Company has made (I should say these two organizations of the Hope and the People's) a great work has been done for the gas industry in drilling these deep wells. It may be possible that a large amount of gas will be added to the waning supply by the further drilling in these regions where you have the great thickness of shale — this Devonian shale overlying the porous sands so that the gas industry ought to feel grateful to these great companies for the campaign of deeper drilling because they have been unaided from any other source except their own private resources. After beginning with the Pew well on the Geary farm about ten years ago they have prosecuted the work continuously starting one well after another and finally they have succeeded in beating the German record in two West Virginia wells which are deeper than any other in the world. This last and apparently successful deep well drilled under Mr. J. B. Tonkin's supervision on Chestnut Ridge makes the fourth trial of these organizations controlled by the Standard of New Jersey. I thought you would be interested in learning something about the deepest gas well in the world and where it has been found and the possibilities it opens up for a larger supply of natural gas from a region that had been condemned both by theory and the wells that had heretofore been drilled in it none of which had been drilled deep enough. So that it is of great interest to the gas fraternity to show that such progress is being

made in the efforts to keep up the supply of this natural fuel. I should add, however, that there will be no McKeesport drilling in that field because these wells being so deep are very expensive and it requires the most successful driller to be able to negotiate a well down even to this Oriskany Sand. It comes, however, twelve to fifteen hundred feet above the "Clinton," first so called by Dr. Orton, State Geologist of Ohio, from some fossils that may have fallen in from higher up. He found a certain kind of fossil there that had not been found anywhere else except in the Clinton formation which overlies the Medina and as he named it the Clinton the drillers got familiar with it and began calling it the Clinton so that probably it will always remain the Clinton in the nomenclature of the drilling fraternity. But I think it is really the Medina which was named from the town of Medina in the State of New York, just like Clinton is named from Clinton, New York. It is twelve or fifteen hundred feet from the Oriskany horizon down to that, so that, of course, the deeper you go you will have other shales to roof over and keep in gases so that there may be other geological horizons that it may be possible to penetrate when the drilling art is carried further and we find some rich gas bearing horizons still below the Oriskany.

Hence the gas situation while it looks gloomy viewed from the fields that have already been developed in the shallow sands yet there may be a great deal of gas bound up in the deeper horizons in and surrounding the Alleghenies. However, I do not think there will be any rush to get leases there because it requires such vast expenditnures of money to get down to the gas horizons. However, it remains for a few feet more of drilling in this particular well, to develop just what it means. Of course, we shall have an immense rock pressure there. The highest rock pressure ever measured was taken at a Hope well in Lewis County, it was 2250 pounds rock pressure at a depth of about 4500 feet, thus confirming the theory that rock pressure increases about in proportion to water pressure as we go down. Previous to that in this Benson sand, as it is known, in the course of development in West Virginia we had a measured pressure of only 1800 pounds but I did not believe the records

were right because at that great pressure a well of small volume with numerous leaks under such high pressure at the joints will lose gas as fast from above as it comes in from below so that it apparently went to 1800 pounds and stopped, until this new superintendent of the Hope Company who I think took Mr. Williams place, saw to it that the joints of the tubing in this particular well were made tight and then the pressure went up to what it should have been, 2250 pounds at a depth of approximately 4500 feet.

Now, if this pressure keeps on increasing in proportion to the water column as we have every reason to believe it will, at the depth of 6800 feet you can see it would be a very enormous rock pressure and it would almost be impossible to shut a well of that kind in with ordinary tubing. You should have to have enough line capacity to turn it into your main line and utilize it. You could not shut it in at that pressure. It would run from thirty-two to thirty-five hundred pounds to the square inch and could not be controlled by ordinary tubing. It would blow it up. It would have to have a special tubing manufactured for that particular purpose or else have a line capacity enough to take care of this out-put. That was where the danger was in drilling in fully this well at that depth into such a possible great thickness of sand. It could not be taken care of. You could not shut it in, or turn it into the ordinary pipe line since you could not use it fast enough to keep it within control. But it remains to be seen what they will find when they drill deeper. Of course, they will not do it until they are able to take care of it, either by shutting it in with specially made tubing or getting it into a line where they can take care by consumption of whatever they may get. I thank you (applause).

President Oliphant: I am sure we have all listened with a great deal of interest to the remarks of Dr. White. When he says we were short of gas in Buffalo last year he is quite right, yet there are a great many people in Buffalo that still seem to think all we have to do is to lay a line down tothe McKeesport field and we will have all the gas we want in Buffalo. Apparently, however, from Mr. Moyer's paper that cannot be the case.

We have with us today Mr. Roswell H. Johnson who has prepared and will present to us a paper a little bit later. Probably Mr. Johnson would like to say a few words regarding Mr. Moyer's paper. Won't you step forward where we can all hear you, Mr. Johnson?

MR. ROSWELL H. JOHNSON: Mr. President and Gentlemen; I think the suggestion that Dr. White made with reference to carrying our work further east in the Appalachian Gas Fields is well worthy of consideration. At the same time I may say I think the very interesting and instructive address of Mr. Moyer's records about all that we can reasonably expect to see in the way of extension that may be expected in the near future. The cities that are now being supplied by natural gas require more and more gas owing to the fact that there are new consumers and there is a gradual and steady growth in all of these cities so supplied. This supply that we have is a supply that ought to meet the growing need of the cities that are already supplied so that I think that Mr. Moyer's prediction may be expected to be followed out. I thank yau (applause).

PRESIDENT OLIPHANT: Gentlemen, any further discussion of this paper.

MR. W. I. MOYER: Mr. President, when the time comes that we can drill to seven thousand feet for gas it will mean that gas will cost the consumer much more than thirty-five cents, Which I presume is the average rate in many of our larger cities. The possibility of the extension to the east is one of the most interesting things that Eastern Geologists can contemplate and I am very grateful to Dr. White for his having aided us by the suggestion which he has made. However, it must be borne in mind that it will be very expensive drilling and at present prices I do not believe the company could afford it even though the gas were there.

PRESIDENT OLIPHANT: Any further discussion, gentlemen The next order of business according to the regular program is the Wrinkle Department of which Mr. W. Re. Brown of Columbus, Ohio, is editor and Mr. W. H. Sedberry of Houma, Louisiana, is assistant editor. Mr. Brown and Mr. Sedberry have worked very hard in getting up this Wrinkle Department

and they have gotten out and presented to us some very good wrinkles. I know if they checked up everybody or every company as they checked up the Iroquois Gas Company to get in more and more wrinkles they must have worked very hard and must have covered the field very thoroughly. They have presented a great number of very good wrinkles. I now take pleasure in presenting to you Mr. W. Re. Brown, Editor of the Wrinkle Department (applause).

Mr. W. Redfern Brown, New Business Manager, The Ohio Fuel Supply Company, then said: Mr. President and Members of the Natural Gas Association of America; I have learned by experience the advantages of many of the suggestions which are incorporated from year to year in the Wrinkle Department of the Association and in presenting the Wrinkles for 1920 I feel that we can do no better than to read to you the introduction which appears immediately preceding the Wrinkle Department in the pamphlet, copies of which have been distributed to the members of the association.

After reading the introduction which appears later as a part of the Wrinkle Department, Mr. Brown said: I might say in addition that the Judges who make the awards for the best wrinkles have a very difficult duty to perform. And I think that every natural gas man should be good enough sport to take the decison of that Committee as final. I feel that the Judges are very conscientious in the awards they make and I know how hard they have worked on it and how difficult it is for them to render a judgment that will please everybody. Referring to Wrinkle No. 108. That was one that I tried to check up in the wrinkles presented some time ago. In this case there is an adjustable alarm on a gauge to show when extremes of pressure are reached and in checking wrinkles already submitted at first I thought this was a wrinkle which had already been submitted but upon further investigation it shows that it is simply an improvement on the other. I simply mentioned that to illustrate the fact that improvement is going on continually through the Wrinkle Department.

I would also like to say that the men who get these wrinkles to study and to refer to should be the men in the shops where

it relates to a mechanical device and to the men in the offices or accounting department where it relates to some improvements in those departments. Those are the men who should receive copies of the Wrinkle Department as it is of great advantage to them and it is from them that we may expect future wrinkles in the way of little betterments and improvements or some advancement in this line or that line and even though they do not adopt it, it will present to them a suggestion which will lead to still further improvement or betterment and when the wrinkles presented have done that they will have accomplished their purpose.

I just wish in closing to thank all of those who have helped in the preparation of this department. All of the companies and their respective employes in many instances have worked splendidly this year. If they keep up the good work the Wrinkle Department of this Association will give us that increase in benefit that we may derive from it in order to make it worth while. I thank you (applause).

Mr. W. Redfern Brown, as Editor of The Wrinkle Department, then presented the following:

INTRODUCTION

From the natural gas men of Canada and the United States we have this year received the greatest number of "wrinkles" ever submitted to our association. The men all along the line responded splendidly to the call made by the increasing problems of the natural gas industry. Each contributor should get full credit for doing his bit to better conditions. The Wrinkles need no comment. It is not the duty of the editors to judge their comparative merit. They have been given freely by the men named. Many of these men have gone to considerable trouble and expense to present these new ideas and better methods. They wish to benefit the natural gas business as a whole, or at least improve some branch of it.

The wrinkles submitted are supposed to be original with the men who have forwarded them to the editors, but it is rather difficult to secure absolutely new things, unless they have first been through Uncle Sam's patent office. Most of the contributions this year meet the requirements set for "wrinkles." They give just some little betterment, something to add to the progress of the industry.

In the last ten years a great many good wrinkles have been published by the Association. It is safe to say most of these things are now general practice throughout the natural gas world.

The ideas brought out this year should be adopted whereever they can be of advantage. See to it these Wrinkles get the attention of the men who can use them.

If the supply of natural gas seems to be growing less, the supply of "wrinkles" is increasing. This is just as it should be. We must devise ways for getting the most out of what we have to work with.

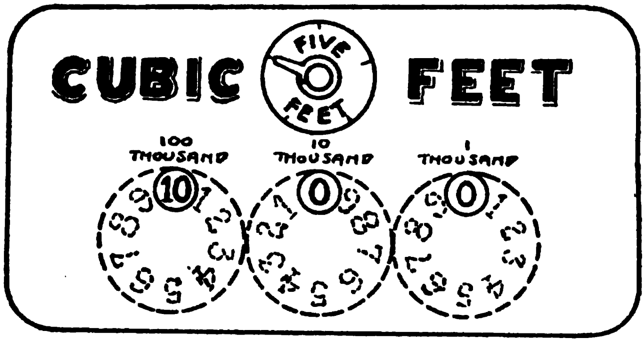
W. RE. BROWN,
Editor.

WRINKLE NO. 1

METER DIAL WITH REVOLVING DISK AND NO HANDS

W. D. R. Evans, The East Ohio Gas Co., Canton, Ohio

The accompanying sketch illustrates a dial for use on gas meters, but can be used on other meters, as well. This dial has no hands, but a disc with the necessary figures on it revolves under the dial, and the consumption shows thru the holes in the dial proper.

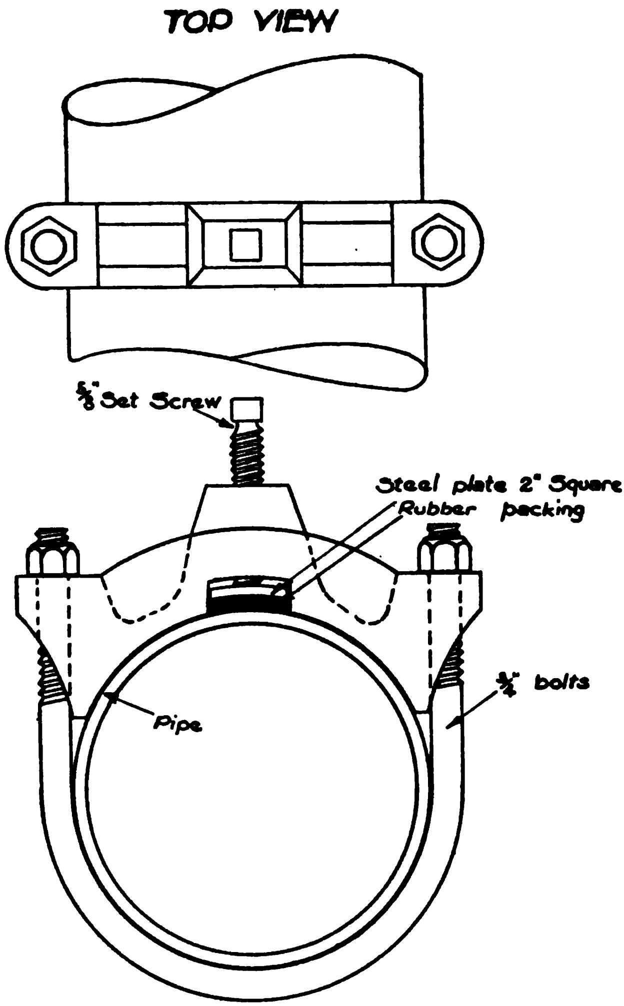


Wrinkle No. 1

This disc does not revolve as the gas passes thru the meter, but stays at the consumption shown, for instance, using a par meter for illustration. After 100 feet of gas is consumed, it then registers 100 feet and stays there until 200 feet is used, and so on.

As the sketch shows, there are no figures to read, except the consumption shown at that time. This would eliminate the waste of time, verifying meter readings after bills had been delivered, as the consumer could easily read their own meter.

At this time, the mechanism has not been entirely worked out, but it would be similar to the mechanism of a speedometer.



LEAK CLAMP
FOR SMALL LEAKS
IN HIGH PRESSURE LINES

Wrinkle No. 2

WRINKLE NO. 2

SPECIAL LEAK CLAMP TO REPAIR SMALL LEAKS IN HIGH PRESSURE LINES

WM. McMILLAN, IROQUOIS NATURAL GAS CO., BUFFALO, N. Y.

In many cases of leaks in high pressure lines resulting from pit holes in the pipe, considerable difficulty was experienced when using the ordinary blind saddle to repair the leak, in making the gasket tight directly over the hole. The Clamp shown in the sketch was designed to overcome this difficulty and at the same time to use a minimum amount of metal.

WRINKLE NO. 3

OIL SEAL SAFETY TANK FOR ALL PURPOSES

FOREMEN, UNITED NATURAL GAS CO., OIL CITY, PA.

Drawing No. B-62—This shows our standard oil seal safety tank for all purposes ranging in size from 4 inches to 12 inches.

WRINKLE NO. 4

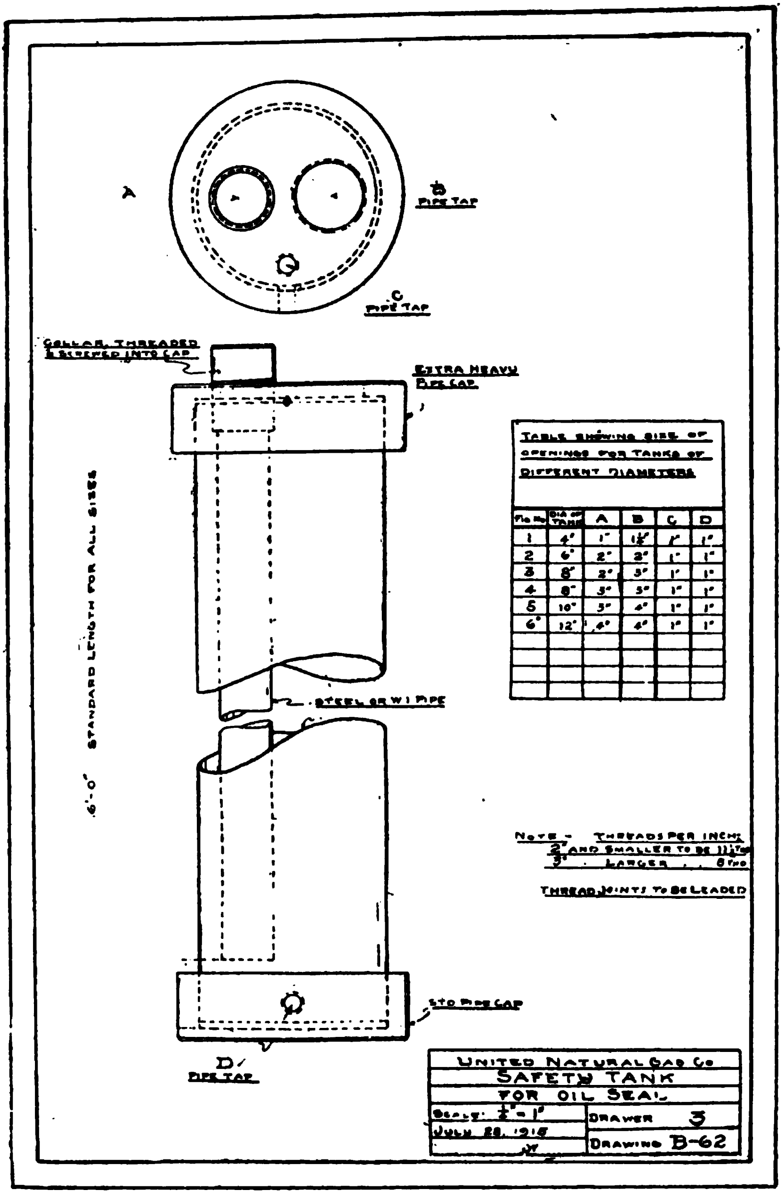
IMPROVED METHOD FOR HANDLING LARGE WALL MAP

J. O. EASLY, THE EAST OHIO GAS COMPANY, CLEVELAND, OHIO

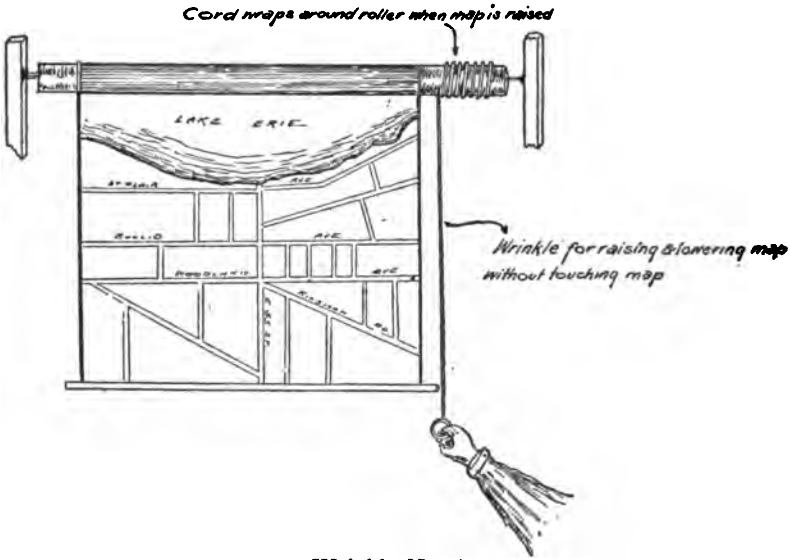
The accompanying sketch shows a large wall map hung on a spring roller, with a split roller at the bottom.

The old method of raising or lowering a map is by taking hold of the roller at the bottom; but this method gradually increases the strain on the map as it is drawn down because of the increased tension of the spring as the map is unrolled. In time this will draw the map out of shape, causing it to buckle and finally destroying its surface.

Frequently a map is raised and lowered by taking hold at the side which places all the strain between the point of contact and the roller, thereby stretching and tearing the map.


A
B PIPE TAP
C PIPE TAP
COLLAR, THREADED & SCREWED INTO CAP
EXTRA HEAVY PIPE CAP
6'-0" STANDARD LENGTH FOR ALL SIZES
STEEL OR W.I. PIPE
STD PIPE CAP
D PIPE TAP
TABLE SHOWING SIZE OF OPENINGS FOR TANKS OF DIFFERENT DIAMETERS
Tk No. | DIA OF TANK | A | B | C | D
1 | 4" | 1" | 1½" | 1" | 1"
2 | 6" | 2" | 2" | 1" | 1"
3 | 8" | 2" | 3" | 1" | 1"
4 | 8" | 3" | 3" | 1" | 1"
5 | 10" | 3" | 4" | 1" | 1"
6 | 12" | 4" | 4" | 1" | 1"
NOTE - THREADS PER INCH:
2" AND SMALLER TO BE 11½
3" LARGER 8
THREAD JOINTS TO BE LEADED
UNITED NATURAL GAS CO
SAFETY TANK
FOR OIL SEAL
SCALE: ½" = 1'
JULY 28, 1915
DRAWER 3
DRAWING B-62

Wrinkle No. 3



Wrinkle No. 4

The improved method of raising and lowering map, as shown by accompanying sketch, is to fasten a cord securely near the end of the roller, winding it around the roller the same as the map. When the map is rolled, about two feet of cord remain free for the purpose of lowering. By using this method, the map need never be touched in raising or lowering the same, thereby prolonging its life.

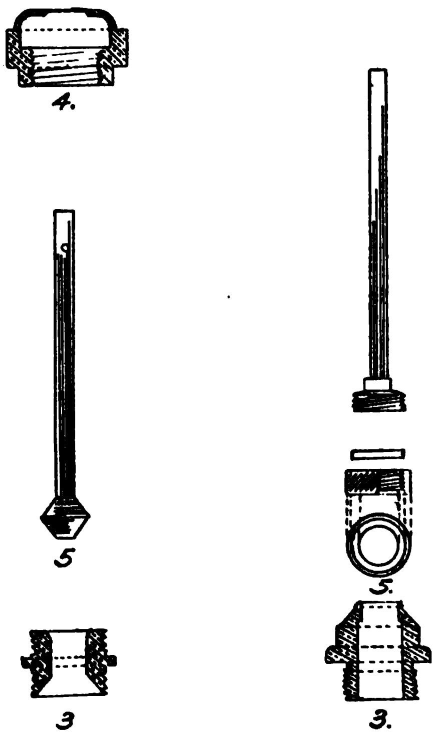
WRINKLE NO. 5

IMPROVED VALVE AND SEAT FOR HOUSE VALVES

J. F. MASON, UNITED NATURAL GAS CO., OIL CITY, PA.

For a number of years, we of the United Natural Gas Company were very much annoyed because of foreign matter in the gas getting under the metal seat of the Chaplin Fulton house valves, also because of the difficulty regrinding these metal seats after they had become worn, so as to insure a good shut-off valve when gas was not being used by consumer.

After considerable experiment the improved valve and seat shown on the right of the accompanying drawing was submitted by three of our foremen, Messrs. Hanchett, Stein and Ward. The Chaplin Fulton Parts Nos. 3, 4 and 5 as shown on the left of the drawing show the old style metal house valve



Wrinkle No. 5

and seat. These three parts are taken out of the regulator and new parts procured from the Chaplin Fulton Manufacturing Company, 3 and 5 as shown at the right of the drawing are substituted. The seating ridge of the new part 3 is on the top instead of being recessed as in the old part. The seat proper and stem is made up of a new stem with an enlarged end carrying threads and a thimble with a 1/32 flange on the lower por-

tion, which screws on to the screw end of the stem and either a rubber or a leather seat placed within the thimble before it is screwed on to the stem. This leather or rubber seats directly on to the smooth ridge of part 3.

With the improvement we are able to repair regulators in about 1/20 of the time previously required where metal seating was installed and we do not have anywhere near as many regulators sent to our shop for repairs with the new appliances as we did have with the old. After the new appliance has once been installed the actual repairs can be made in a few minutes, simply by unscrewing the thimble and exchanging a new leather or rubber seat for the old one.

The advantage of rubber or leather seat over metal seat in low pressure service is very pronounced, especially in preventing the pressure climbing when consumer is not using any gas. The rubber seat is used where the inlet to the regulator pressure does not exceed fifty pounds and where the gas is known to be perfectly clean and dry. The leather seat is used under the same conditions, if one desires it with the same degree of safety and can be used under any condition where the metal seat formerly was used with absolute safety from fluids or dirt in the flow of the gas.

We owe much of the success of this appliance to the courtesy of the Chaplin Fulton people for making up same from crude hand made samples furnished to them bv us, and after two years' experimenting this appliance was turned over to the Chaplin Fulton Company.

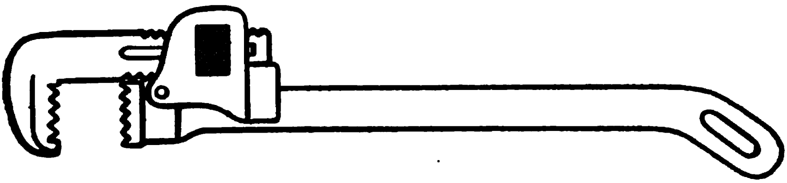
WRINKLE NO. 6

SLOT IN HANDLE OF WRENCH TO TURN STOP

W. F. Kelly, Berea Pipe Line Co., Berea, Ohio

In setting meters, making service connections, etc., I find that a slot, at an angle, in the handle of a 14-inch Trimo wrench saves time.

The slot will take the head off a stop, and saves running the wrench up. See drawing.



Wrinkle No. 6.

WRINKLE NO. 7

IMPROVED METHOD OF REPAIRING LEAKS AT FITTINGS IN LARGE PIPE LINES

WM. MCMILLAN, IROQUOIS NATURAL GAS CO., BUFFALO, N. Y.

Leaks in large pipe lines at fittings are often the most expensive and difficult ones to repair, necessitating generally the removal of the fitting.

In this method of repair, all the composite parts are Standard Dresser parts and are assembled as follows:

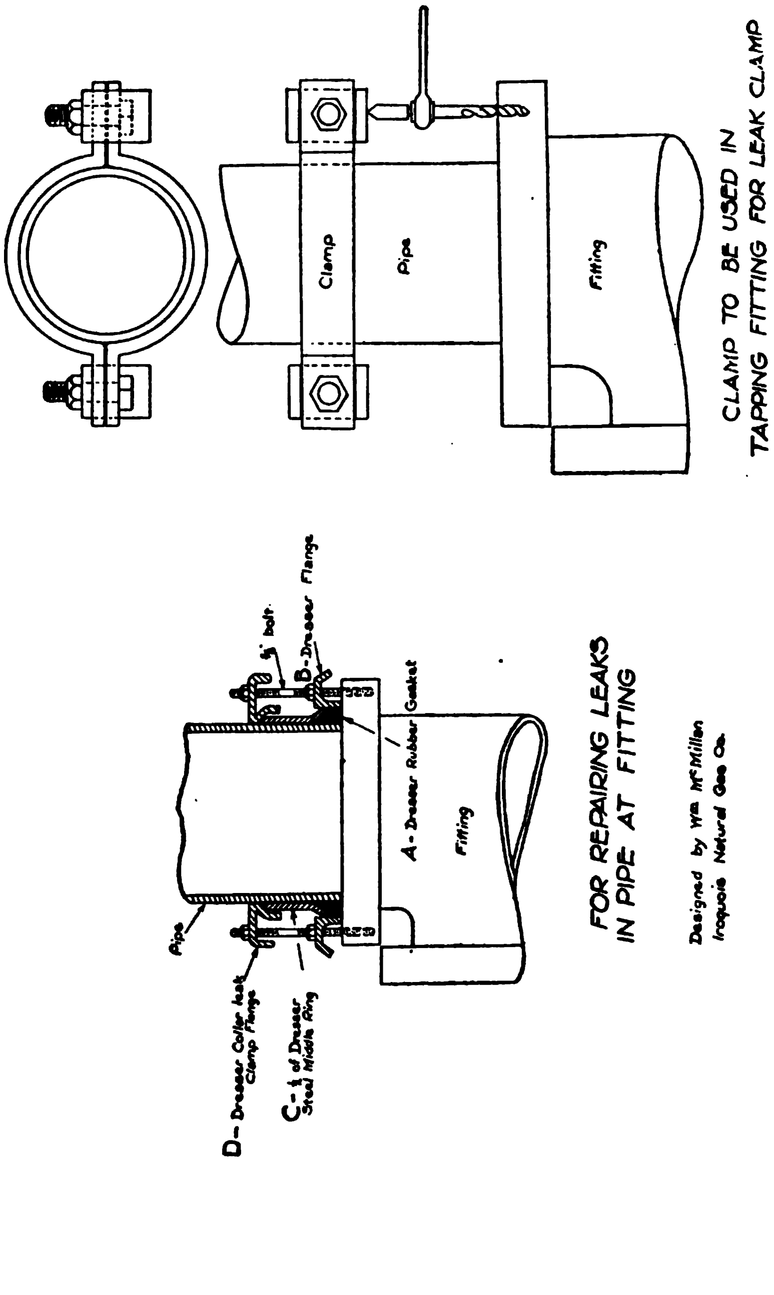
A — The gasket is the Standard Dresser style L (Plain grooved rubber) gasket.

B — The flange next to the fitting which holds the gasket in place is the flange from a Dresser pipe coupling Style 38 with the inner flange cut out. This flange must be cut in half in order to install.

C — The middle ring is one-half of the middle ring of a Dresser pipe coupling Style 38. This also must be cut in half in order to install.

D — The outer flange is a flange from a Dresser collar leak clamp Style 41.

The other clamp shown in the sketch was designed to be used as an "Old Man" in drilling the holes in the fittings. Four bolts are generally sufficient to insure a tight job.


Clamp
Pipe
Fitting
CLAMP TO BE USED IN
TAPPING FITTING FOR LEAK CLAMP
Pipe
D- Dresser Collar leak Clamp Flange
C- ½ of Dresser Steel Middle Ring
B- Dresser Flange
A- Dresser Rubber Gasket
Fitting
FOR REPAIRING LEAKS
IN PIPE AT FITTING
Designed by Wm McMillan
Iroquois Natural Gas Co.

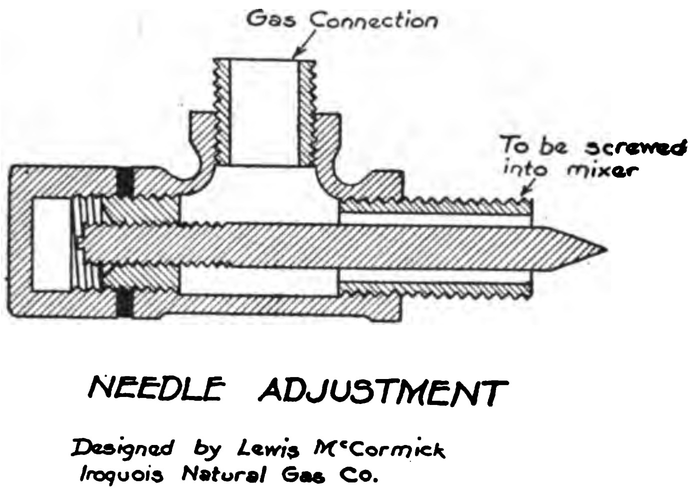
Wrinkle No. 7

WRINKLE NO. 8

NEEDLE POINT ADJUSTMENT FOR MIXERS NOT HAVING ADJUSTABLE ORIFICES

MR. LEWIS MCCORMICK, IROQUOIS NATURAL GAS CO., BUFFALO, N. Y.

Sketch shows a Needle Point Adjustment which can be installed in connection with mixers on ranges, furnaces, etc., that do not have adjustable orifices.



Wrinkle No. 8

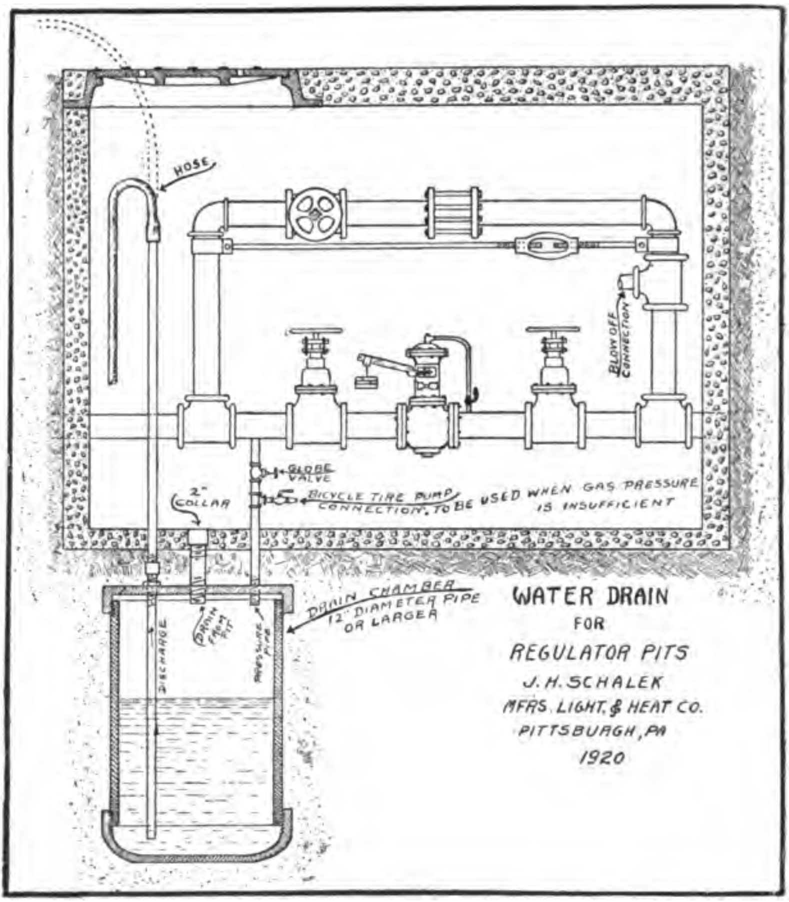
WRINKLE NO. 9

WATER DRAIN FOR REGULATOR PITS

J. H. SCHALEK, MFRS. LIGHT & HEAT CO., PITTSBURGH, PA.

It is not the unusual thing after a rain storm to find regulator pits and gate pits, with special reference to those located in streets, with two or three feet of water in them. The water must be removed somehow. The usual practice is either by bailing with a bucket attached to a rope or by means of a cumbersome pump and hose. In the first method the result is positive but wasteful of time. Time is not cheap any more. The second method also produces results but Mr. McAroney will

either break his back carrying the pump or acquire radial deformation of the spine or lumbago or measles or something else. Pumping with the usual portable pump is an arduous task.



Wrinkle No. 9

An extra man is usually present to keep the pump going while the other operator is recuperating.

The method pictured in the accompanying sketch employs the simple expedient of allowing the gas pressure to force the

water out of the pit. The cycle of operation is as follows: Close the 2-inch drain pipe by a plug which has a three-foot "T" handle welded to it. Then open the globe valve leading from the high pressure side of the regulator. The pressure acting on the surface of the water will force it out of the drain chamber and into the street gutter if the hose is in position as shown by the dotted outline. The operation may have to be repeated if the amount of accumulated water is in excess. In this case close globe valve, open drain pipe, allow chamber to fill, close drain pipe and open pressure valve. When it becomes necessary to drain the pit when the gas pressure is insufficient to force the water out, a two cylinder tire pump will work efficiently. A hose connection cock has been placed on the pressure pipe for this purpose.

The hose fastened to the discharge pipe is a permanent fixture and when not in use appears as in sketch. The drain chamber may either be a vertical affair as pictured or placed in a horizontal position. A horizontal drain chamber and of a length equal to that of the pit will be more satisfactory in pits where the accumulation of water is frequent and very large.

WRINKLE NO. 10

CLAMPS USED TO QUICKLY REPAIR LEAKING JOINT

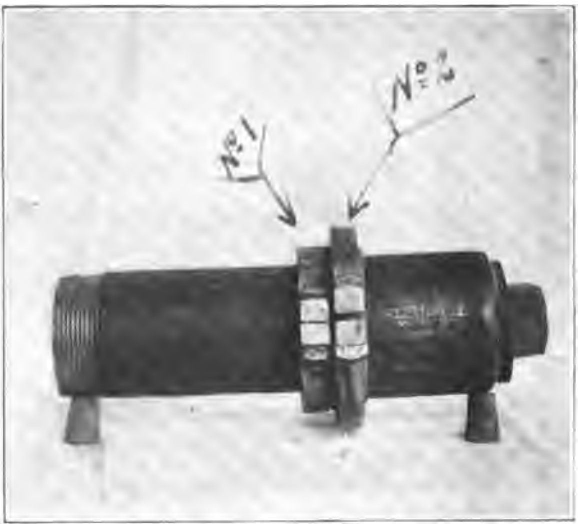
GEO. OFFENBACHER, THE OHIO FUEL SUPPLY CO., COLUMBUS, O.

The clamps illustrated in the photograph may be used to quickly repair any old line at collar, tee, ell or other fitting having a leak at joint.

This device consists of two clamps. No. 1 is first fastened securely around pipe, just far enough from the collar, or other fitting, to admit a rubber gasket. The gasket is then placed around the pipe and the clamp, marked No. 2 in photograph, is placed over the gasket and drawn tight by the bolts. This squeezes the rubber gasket up against clamp No. 1 and also forces it up tight against the face of fitting, making a secure, tight repair.

Each clamp consists of two half-round pieces of heavy wrought iron or steel, clamped with bolts on both sides. To prevent the rubber squeezing out at bolt joints, a small piece of flat curved metal is placed under the joints to give a smooth, continuous surface on the inner side of clamp.

This device makes a tight joint, even when face of fitting is beveled, whereas the ordinary coupling will force the rubber up over the beveled edge in place of stopping the leak.



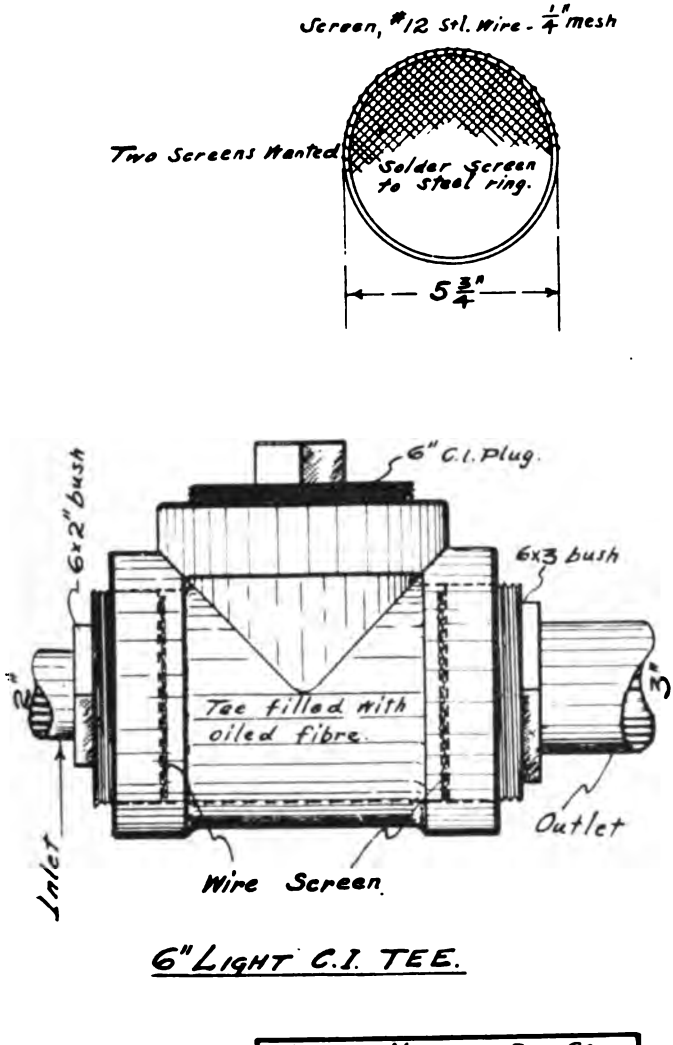
Wrinkle No. 10

WRINKLE NO. 11

DIRT AND DUST CATCHING APPARATUS

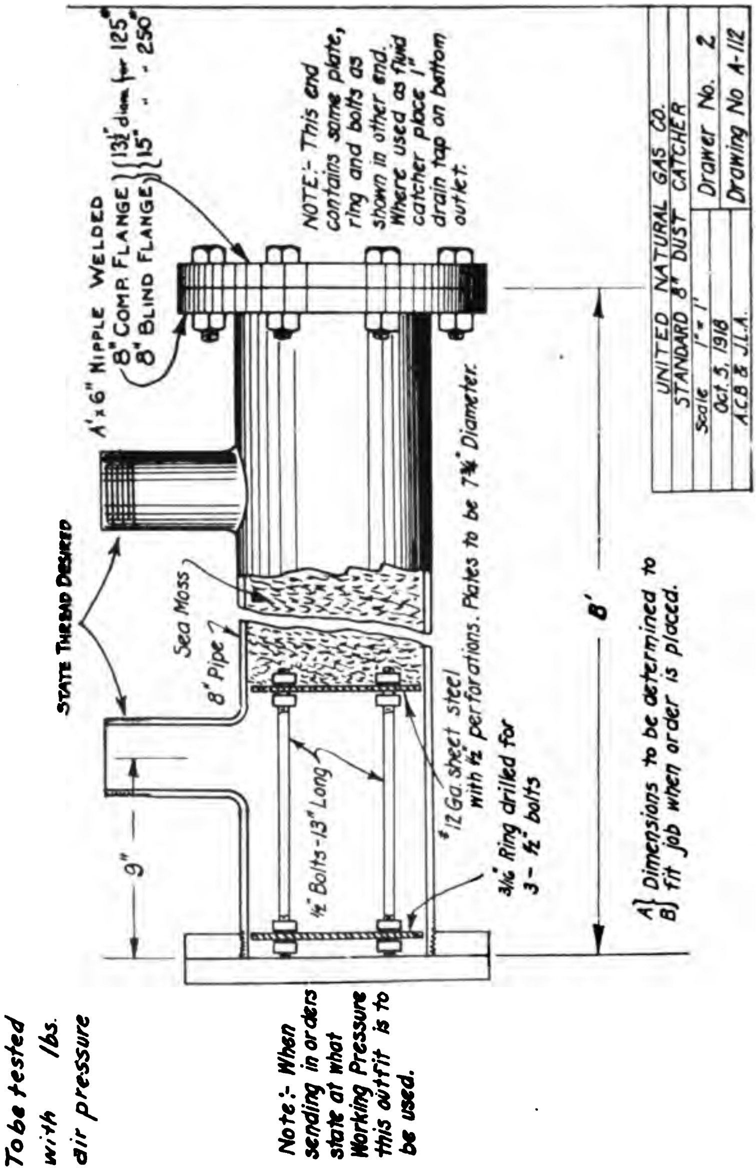
FOREMEN, UNITED NATURAL GAS COMPANY, OIL CITY, PA.

Drawings A-82, A-112 and A-84 show different dust catching apparatus. The particular one used on either high or low pressure lines depends upon the volume of gas passing through such line and sometimes depends on the location where appliance to be used and the convenience of looking after same.

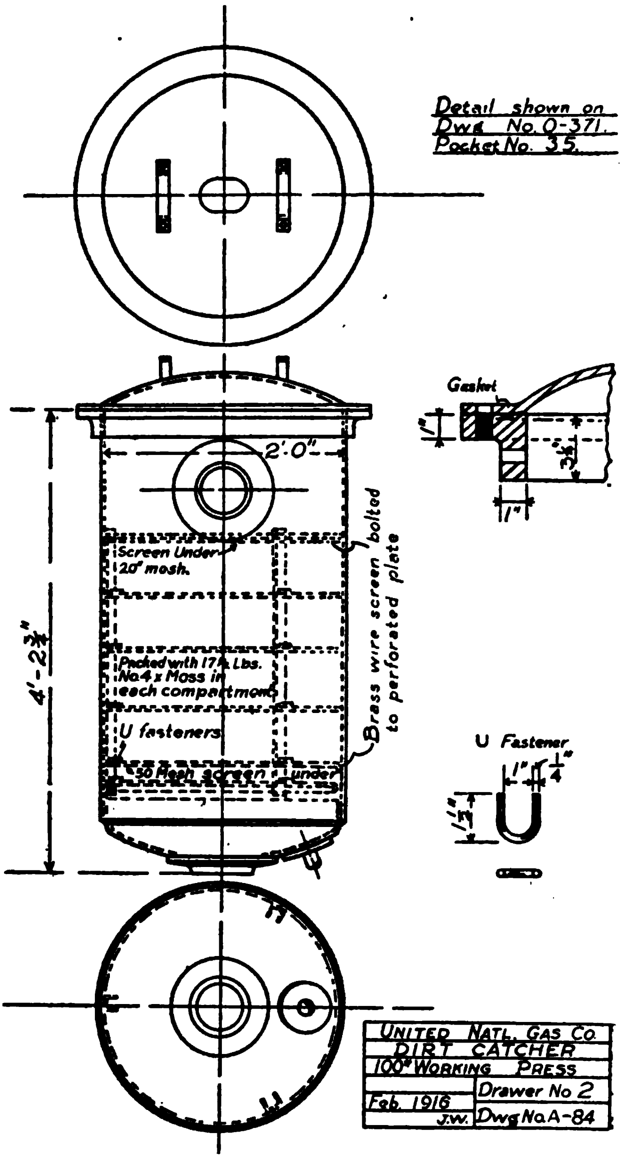


UNITED NATURAL GAS CO.	
DIRT CATCHER	
(FIELD)	
MCH. 1916	DRAWER No. 2
JW.	DWG No A-82

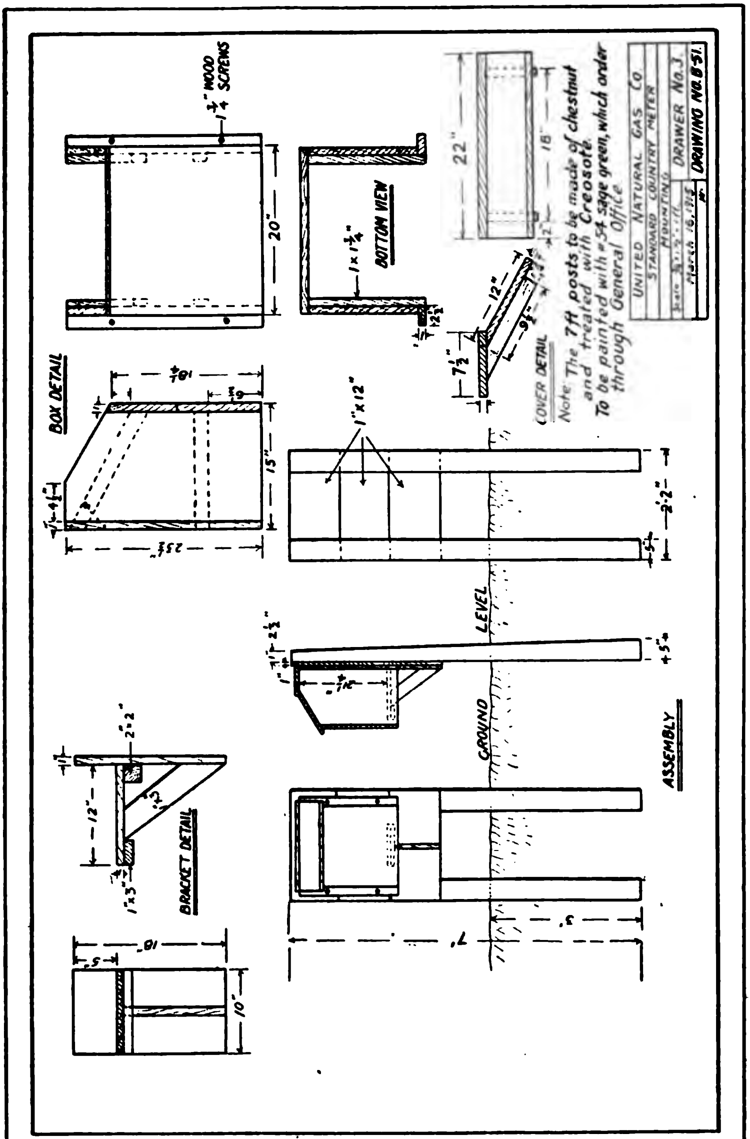
Wrinkle No. 11



Wrinkle No. 11



Wrinkle No. 11



Wrinkle No. 12

WRINKLE NO. 12

METER MOUNTINGS ALONG COUNTRY ROADS

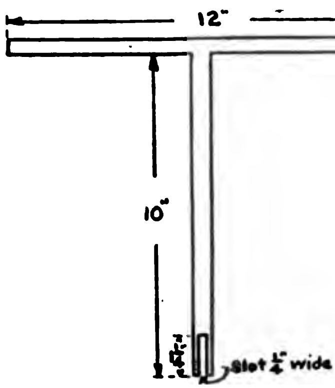
FOREMEN, UNITED NATURAL GAS COMPANY, OIL CITY, PA.

Drawing No. B-51 shows what we call our country meter mounting, where our meters are set along the road from low pressure lines in scattered country districts.

WRINKLE NO. 13

HANDY TOOL FOR REMOVING METER RIMS

W. C. CAREY, IROQUOIS NATURAL GAS CO., BUFFALO, N. Y.



Wrinkle No. 13

A small tool made of ½-inch octagonal steel, and according to the design as shown in the sketch, has proven to be a very useful tool for removing the rim from small tin meters after the leather has been removed. With the use of this tool, there is less liability of damage being done to channels and other parts.

WRINKLE NO. 14

METHOD OF OILING DIAPHRAGMS OF TIN METERS

W. C. Carey, Iroquois Natural Gas Co., Buffalo, N. Y.

In this method the diaphragm of the tin meters are oiled without taking off the fronts and backs, thus saving time and also doing away with the oil bench. The top, back plate, and the valves are removed to adjust and clean. Measure out the exact amount of oil required and pour it by means of a long tubed funnel, down into the diaphragm port of the valve. Turn the meter around a few times, letting it rest for a time on the top, sides and bottom, favoring the top of the diaphragm by allowing the meter to rest bottom side up for a longer time.

Equal parts of Neat's-foot and Sperm oil makes a good oil for leather. The approximate amount of oil required for each diaphragm for different sized meters is as follows. (This amount may be varied somewhat according to the condition of the leather.)

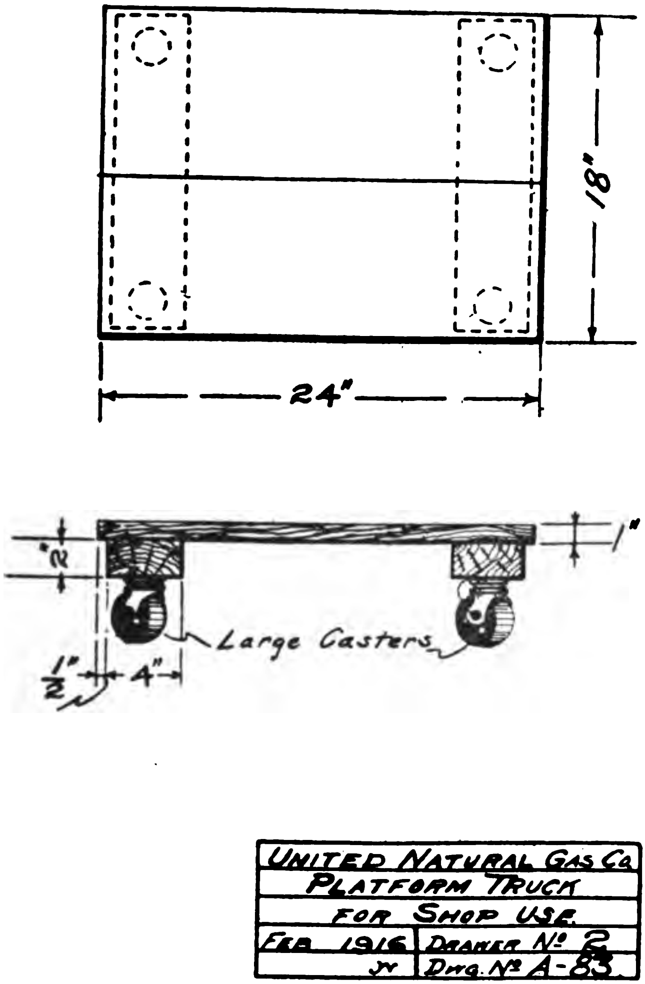
Amount of Oil	*Size of Meter*	*Amount of Oil*	*Size of Meter*
4 oz.	5-light	10 oz.	60-light
5 oz.	10-light	12 oz.	80-light
6 oz.	20-light	14 oz.	100-light
8 oz.	30-light	20 oz.	150-light
9 oz.	45-light		

WRINKLE NO. 15

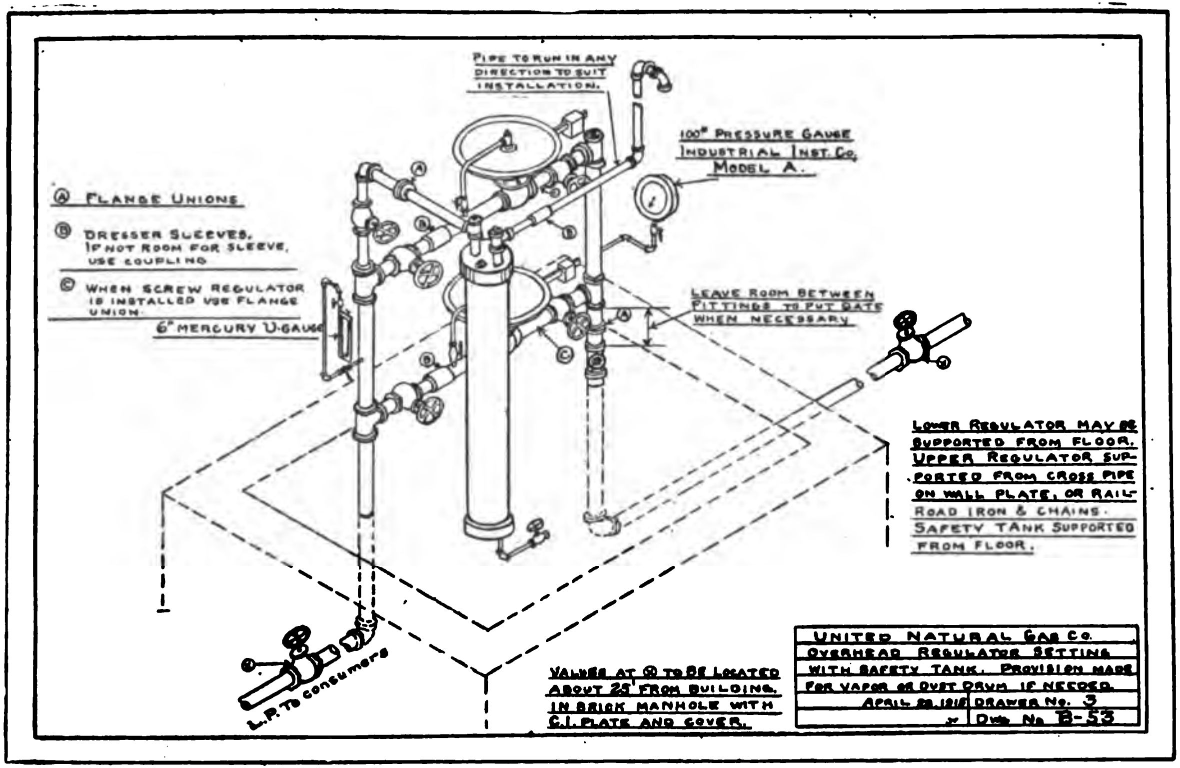
PLATFORM TRUCK FOR HANDLING HEAVY REGULATORS OR METERS

Foremen, United Natural Gas Company, Oil City, Pa.

Drawing A-83 is a little platform truck used in the shop and meter room for the purpose of easily handling heavy regulators and meters.



Wrinkle No. 15



Wrinkle No. 16

WRINKLE NO. 16

HOW TO SET URBAN REGULATORS AND SAFETY TANK

FOREMEN, UNITED NATURAL GAS CO., OIL CITY, PA.

Drawing No. B-53 shows our method of setting urban regulators and safety tank for practically all purposes.

WRINKLE NO. 17

HOW TO COMPLETELY CONTROL ACTION OF GASOMETER

FOREMEN, UNITED NATURAL GAS COMPANY, OIL CITY, PA.

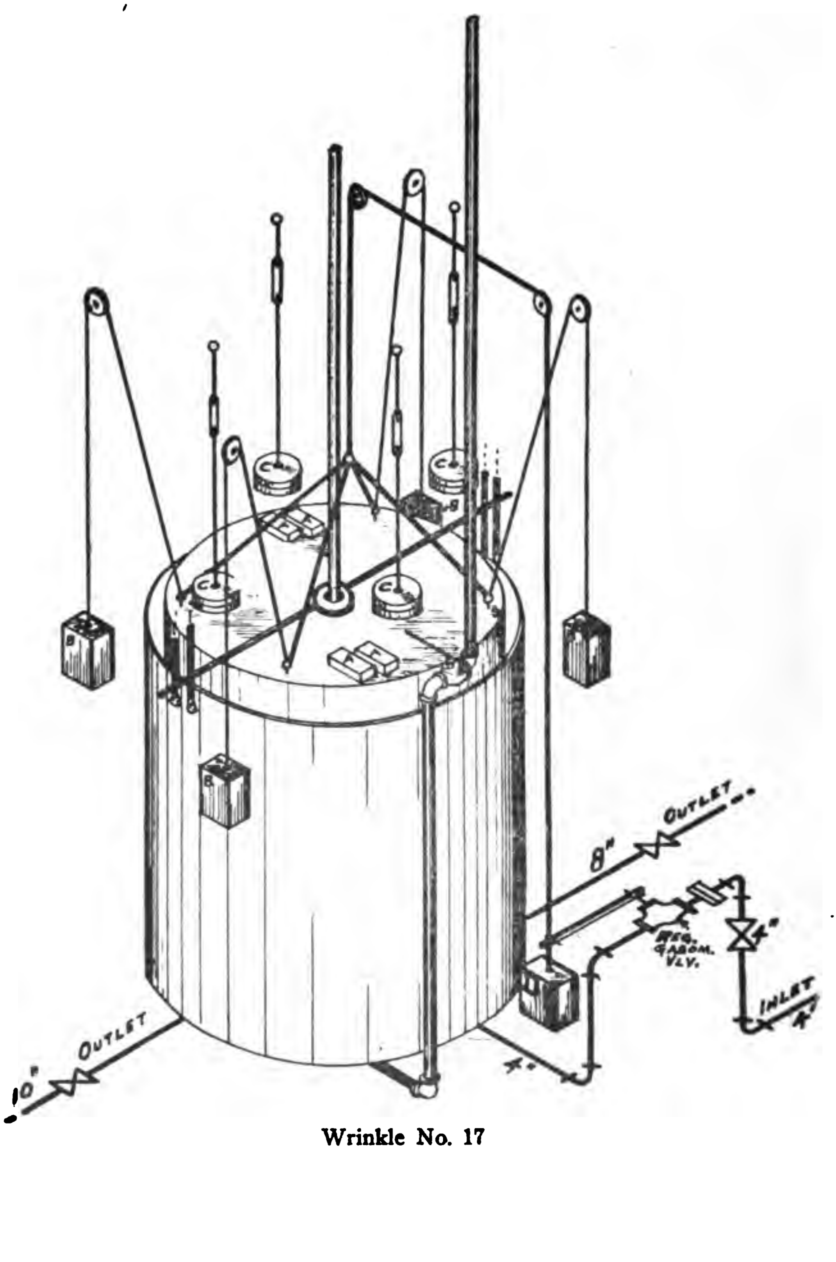
Where the old large gasometer is in use for regulating pressure from high or medium pressure lines into the low pressure system the men of the United Natural Gas Company have worked out methods shown on enclosed picture of completely controlling said gasometer action.

Fig. "A" represents standard ten pound paving brick, which are used when necessary to add weight to ometer float for the purpose of increasing low pressure delivery.

Fig. "B" are boxes for holding as many brick as are necessary for the purpose of off-setting the weight of heavy floats after all surface weight "A" has been removed. This enables the cutting of the low pressure delivery to any desired inches of water pressure and is only used when necessary to conserve medium pressure because of field shortage or severe weather conditions.

Fig. "C" represents weights hung from the joints of a building at different elevations above the float so that in case pressure comes on during the night from the field sufficient to raise the tank beyond safety, it picks up first one and then the other of these suspended weights and prevents the tank from being lifted out of the oil seal and the consequent loss of gas.

Fig. "D" represents the weight on the lever of the regulating valve between the medium and low pressure to insure positive downward action of the valve lever, so that the low pressure can be assured of uniform delivery as left by the man making the last adjustment.



Wrinkle No. 17

WRINKLE NO. 18

TO REPAIR ⅞-INCH IRON SUCKER RODS WHERE THE BOXES HAVE BECOME SPLIT

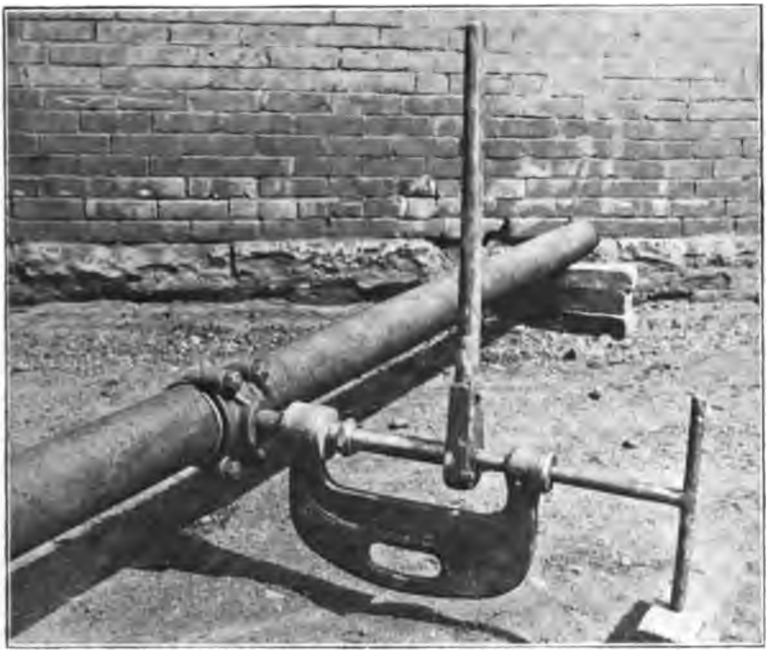
W. A. Hovis, United Natural Gas Co., Clermont, Pa.

We have successfully repaired ⅞-inch iron sucker rods where the boxes have become split, by using old boxes from wooden rods, and turning them to the desired diameter and facing the shoulder square and welding them on the ⅞-inch iron rods.

WRINKLE NO. 19

HIGH PRESSURE OR LOW PRESSURE TAPPING MACHINE

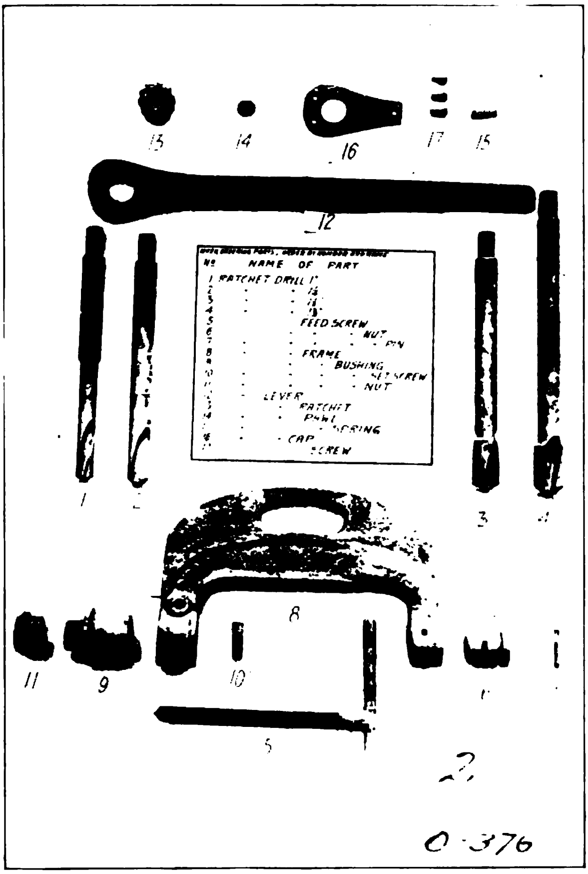
G. T. Spettigue, Supt., United Natural Gas Co., Oil City, Pa.



Wrinkle No. 19

The drilling machine shown in the photographs has been used by the United Natural Gas Company for a number of

years and has proven very satisfactory; it is very simple in construction, very strongly made, has a standard shank 1¼" in diameter, can be used to tap any size opening from ⅜" to 4"; has brass follower, with stuffing box making it a high pressure as well as a low pressure drilling machine.



Wrinkle No. 19

WRINKLE NO. 20

BAILER FOR BAILING OR AGITATING WELLS

MR. C. A. MULKIN, UNITED NATURAL GAS CO., STONEBORO, PA.

As it is difficult to get a bailer of any size down a string of 2-inch tubing, we have made use of a piece of 1½-inch O. D. heavy rubber hose about twenty or twenty-five feet long. For a dart, we use a standing valve for a 2-inch working barrel, tapping the ball and screwing in a ¼-inch bolt.

For a bail, we used a wire line rope socket, with a perforated nipple screwed into the hose connection, and a pin welded into the nipple.

The hose will not hold much fluid, but after it has been run a few times, or if the well is making any gas at all, three or four buckets of fluid will follow the bailer out of the well each time that it is run.

The rubber hose will last for an indefinite period and will go down the tubing even if there are some crooked joints in the well.

WRINKLE NO. 21

CAP FOR METER READERS

WM. C. HENRY, THE EAST OHIO GAS CO., CANTON, OHIO

We frequently have calls from consumers, after meter readers were there, as to whether we had men reading in that particular section. A distinctive cap would eliminate all questions, as to whether the man wearing same was our employee, or not, as it would be more noticeable than the badge which we are now using.

This cap should be adjustable as to size and have the Company's name on same in gold cord, and be numbered consecutively, to be used by meter readers, for purposes of identification.

WRINKLE NO. 22

CONSERVING GAS IN DRILLING BOILERS

M. G. Oakley, United Natural Gas Co., Clermont, Pa.

I find that by placing a piece of sheet iron on top of our Klein boiler burners, allowing it to protrude over the edge of the burner about 6 or 8 inches, that it will cause the tip of the flame to strike lower and more directly on the sides of the fire box, and will greatly increase the efficiency of the burner.

WRINKLE NO. 23

NOTICE OF BEING UNABLE TO READ METER

W. C. Henry and W. C. Evans, East Ohio Gas Co., Canton, Ohio

The cards that we are using at the present time, are double mailing cards, which are mailed by the Ledgerman, when meter reader is unable to get reading. The wording is similar to the

Ledger........Folio........

Our meter reader has been unable to read your meter for the current month, reporting that he finds no one in. Will you kindly return this card promptly, giving us the required information.

Company's Name.

....

.... 192....

House will be open..

Key may be found at..

House will be closed until......................................

Name ....

Address ....

Wrinkle No. 23

card illustrated, only that it is on two stamped cards. One card has our notice to consumer on it, the other part is detached by consumer and returned to us. If this single card is used, the

meter reader calling on first pick up, if unable to get a reading, would leave a notice. The consumer would then mail it back with the desired information on it. In this manner, one cent is saved on each notice, as well as a saving of time necessary for the card to reach the consumer, after meter reader reports to office that he was unable to read meter.

This form is printed on Government postal cards, with Company's name address on reverse side.

WRINKLE NO. 24

REPAIRS TO TAPPING MACHINE

WM. MCMILLAN, IROQUOIS NATURAL GAS CO., BUFFALO, N. Y.

The Company had several tapping machines with one piece guides which had become worn in the spindle threads. An attempt was made to forge new one piece guides but they were not suitable due to the inability to get the holes centered properly.

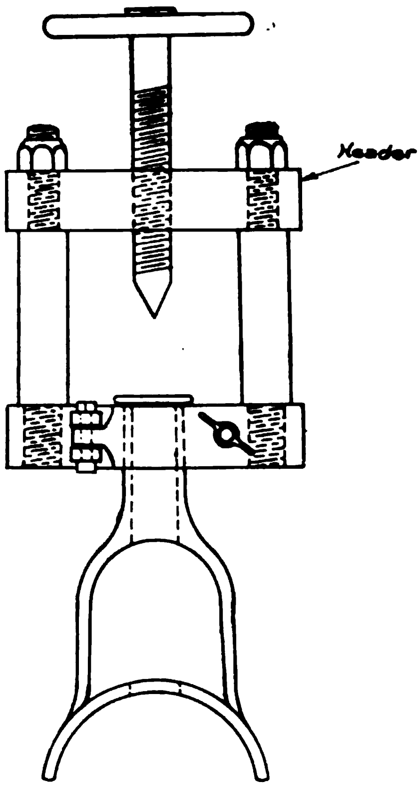
A new guide was designed as shown in the sketch which allows the head piece to be removed and replaced with a new one.

WRINKLE NO. 25

TO CHANGE A 6 OUNCE REGULATOR TO CARRY 3 OUNCES CORRECTLY

H. R. ROGERS, THE LOGAN NATURAL GAS & FUEL CO., TIFFIN, OHIO

The average 6 oz. regulator has too heavy a diaphragm, and the rubber valves are too hard, to shut off at three ozs. To overcome this trouble, put in a light diaphragm, and soft rubber valves, being careful to see that both valves seat at the same time, in this way you can get a nice even chart on 3 ozs. with old regulators.



Wrinkle No. 24

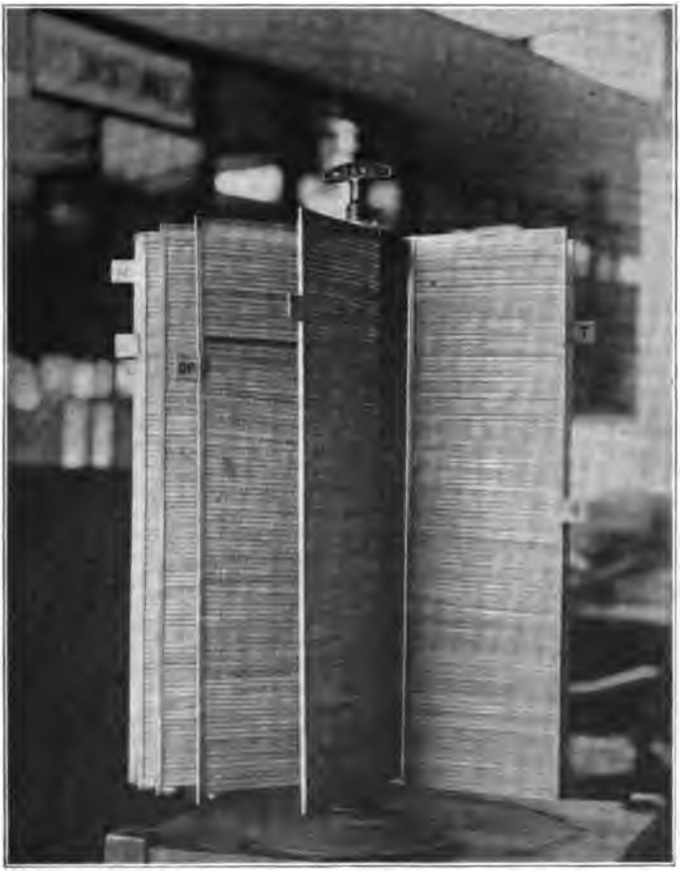
WRINKLE NO. 26

COLLECTION OF OLD ACCOUNTS AND BAD DEBTS

H. S. Tims, Calgary Gas Co., Calgary, Alberta, Canada

During the course of our business we contract quite a number of unpaid accounts, namely, final bills, parties moving from one address to another, or, temporarily leaving the city. Some time ago we put in a "Rand Revolving Visible Index," composed of leaves, or plates, indexed alphabetically, viz., A. B. C., etc., and each leaf holding a hundred transparent tubes in

which is inserted a typed slip covering folio, name, address and amount of the delinquent account. These tubes are then placed in alphabetical order on the leaf of the letter of the alphabet to which it belongs and the index is placed by the side of the con-



Wrinkle No. 26

tract clerk. Every time a consumer comes in to sign a contract the contract clerk turns to his index and by the time the prospective consumer has signed his contract, the clerk knows whether his name appears as a delinquent or not. If the same

name appears, it is then only a matter of a minute to turn up the "Dead Contract", compare the signatures, and if they agree the prospective consumer is compelled to pay his old account before again getting service. I might state that this system has paid for itself many times over, as we have even at times collected accounts which were seven years old.

WRINKLE NO. 27

THE REPAIR OF 2 INCH CRUMBIE TONGS

M. G. Oakley, United Natural Gas Co., Clermont, Pa.

Old 2-inch Crumbie tongs that have become worn so that they are too large for the pipe, can be made to work as well as ever by removing the 2-inch bit and putting in a 3-inch bit to compensate for the wear of the tongs.

This will also work equally as well on the 2½-inch Crumbie tongs.

WRINKLE NO. 28

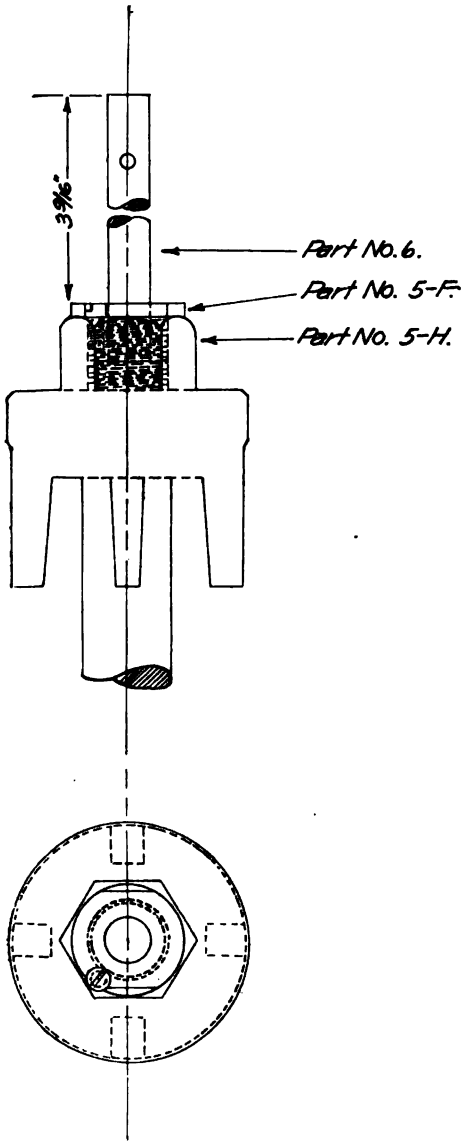
EASY WAY TO REPAIR REGULATOR

J. J. Flynn, United Natural Gas Co., Oil City, Pa.

In the United Natural Gas Company plants we have been using Chaplin Fulton regulators for a great many years during which time we have been bothered a little by Part F. working loose and out, preventing the regulator from functioning.

In the upper drawing will be shown where we have drilled into Part F. putting thread on same and in the lower portion of the drawing will be shown where we have entered a set screw through said threaded opening which firmly secures Part F. against Part 5 and prevents Part F. from working loose.

This is a very simple operation to perform and may be of assistance to others using Chaplin Fulton regulators.

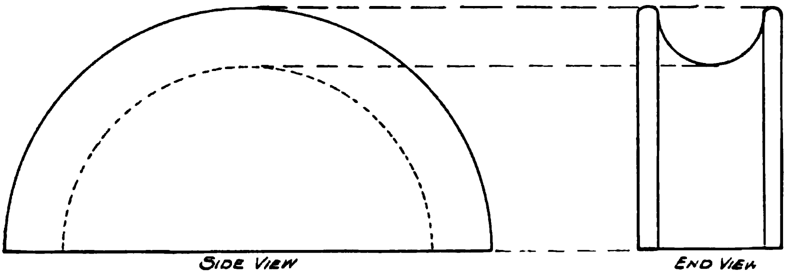


Wrinkle No. 28

WRINKLE NO. 29

BLOCK FOR BENDING METER LEADS

H. F. Tragesser, East Ohio Gas Co., Uhrichsville and Dennison, Ohio



Wrinkle No. 29

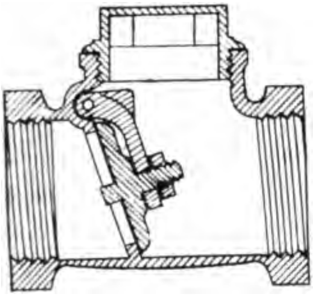
The sketch illustrates a simple and efficient device for bending meter leads. Usually considerable difficulty is experienced in bending them without their kinking. By using such a block they can be bent without any chance of this happening. It can be made of wood at a small expense and little trouble and should be carried with the meter setter at all times.

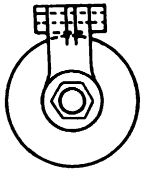
WRINKLE NO. 30

ALUMINIUM CHECK VALVE CLAPPER

Mr. Edward P. McCormick, Iroquois Natural Gas Co., Buffalo, N. Y.

In places using forced air in connection with gas at different appliances, it is advisable to have a check valve installed in the line, at the outlet of the meter, to prevent any possibility of air reverting back through the meter and into the main line. At times of low pressure, this valve may interfere considerably with the service due to the fluttering of the clapper in the ordinary valve. The flapper shown in sketch is made of aluminum and due to its much lighter weight gives better service in times of low pressure than the ordinary brass or iron clapper.





Wrinkle No. 30

WRINKLE NO. 31

TO SUCCESSFULLY SPLICE THE ENDS OF OLD AND NEW WIRE LINES

M. A. BIRMINGHAM, UNITED NATURAL GAS CO., CLERMONT, PA.

Some of our men have experienced difficulty in splicing the ends of old and new wire lines successfully.

I find that by untwisting the new line and forcing additional twist in the old line, I can make a uniform twist in each line and have no difficulty in then making a successful splice.

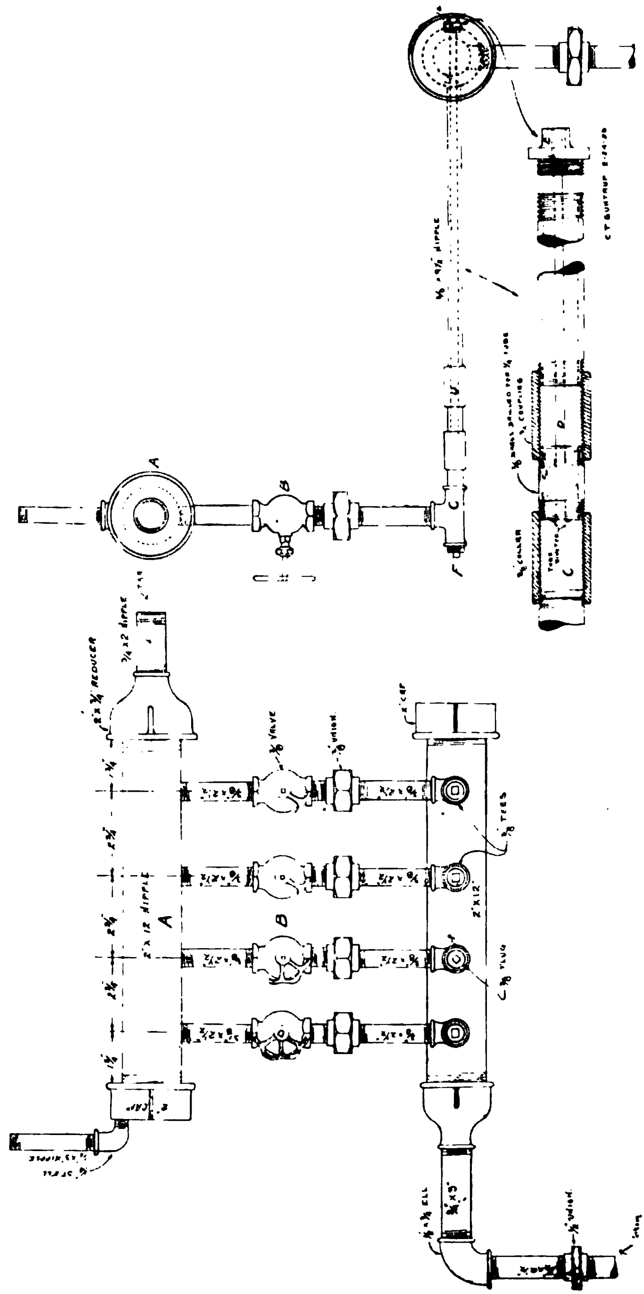
WRINKLE NO. 32

TAR BURNER

JOHN DOOLING AND J. A. ABRAMS, EAST OHIO GAS CO., CLEVELAND, OHIO.

The burner here illustrated was designed to burn tar that contains a very high percentage of water which is almost impossible to separate from the tar. The results obtained were very successful.

The mixture of tar and water contained in the pipe reservoir A is allowed to feed through the valves B into the pipe C from where it must pass through the small tube D to the burner E. The tube D is surrounded by steam which vaporizes the



Wrinkle No. 32

mixture and at the same time passes out thru the burner nozzle to atomize and mix with the tar mixture. Should the tube D become clogged with tar it can easily be cleaned by removing plug F from the Tee connection and passing small wire cleaner through the tube.

WRINKLE NO. 33

TO REPAIR SEATS AND RENEW SAME ON REGULATORS

M. A. Birmingham, United Natural Gas Co., Clermont, Pa.

In repairing seats and renewing same on regulators, we find that it gives us a uniform seat on each seat rubber, to use a brace and grind the rubber seats so that they each will have an equal bearing on the metal seat.

This is done before the regulator is reassembled. It overcomes any variation in the thickness of the rubber, and also any variation in the spacing of the seats.

WRINKLE NO. 34

WAREHOUSE AND PIPE YARD

Mr. Frank D. Wagner, United Natural Gas Co., Shippensville, Pa.

The subject of arranging and maintaining a warehouse stock in the best and most efficient way, is a very broad one, but I would offer the following suggestions as a preventative of lost time and worry in the handling of warehouse stock efficiently:

When pipe is taken from the field to the warehouse yard, it should be assorted and piled, and the threads painted. If it is found that any of the joints are unfit for further use, these defective joints should be piled separately, or on what I term a "Rainy day pile." In inclement weather, this pipe can be inspected and will perhaps require rethreading, new collars or a split section removed from it. When the joint is properly repaired, it can then be transferred to the pile containing good pipe.

The same care should be exercised in the handling of all fittings. When fittings are received at the warehouse, they

should be examined and well oiled, and any that require repair should be placed in a section by themselves and later repaired. I would mention gates in particular. When removed from a line, a gate should never be used again, without first taking it apart and thoroughly cleaning and oiling it. The same should apply to stop cocks. The warehouse should be equipped with shelves and bins, properly labeled. This will prevent lost time when fittings, or other material is required.

When a working barrel is removed from a well, it should never be placed in the warehouse stock until after it has been cleaned and well oiled, especially steel barrels, as they will rust very quickly. Many men have the idea that by filling a working barrel with oil and plugging each end of it, that the barrel will be kept in good condition. In my opinion, this is a mistake. I believe the best way to care for a working barrel properly, is to thoroughly clean it and then draw a quantity of oily waste thru the barrel. This will leave a thin coat of oil adhering to the inside of the barrel. The barrel should then be placed on a bracket in the warehouse, so that it will be off the floor and air will pass thru it. We also have found that by packing a Klein or an O'Dell working barrel (that is used for pumping thru ¾ inch pipe) with common cotton candle wicking, soaked in tallow, that the life of the barrel is prolonged.

In cleaning steel barrels, those that have become worn can be placed in good condition by changing the collars, end for end.

WRINKLE NO. 35

TOOL FOR REPAIRING GAS COMPRESSOR HEADS

PAUL LUEBECKER, THE MANUFACTURERS LIGHT & HEAT CO., WHEELING, W. VA.

This tool has been found very useful for repairing compressor heads where the threads in head have become badly worn. At one time we tapped out these openings and used an over-size valve, but this necessitated carrying so many different size valves in stock, that we finally adopted the method of boring out openings large enough to insert steel bushings, thus keeping

our valves standard size. We have used this tool on all types of compressor heads.

The boring bar is made of machinery steel with slot ½″ x 1¼″ in one end for tools, also tool clamp which is used for holding tools for countersinking or chambering the edges of holes, after holes are bored, to accommodate steel bushings which we are using.

Wrinkle No. 35

The guide or bearing was made of an old cast iron gudgeon. The double ended tools are made of high grade carbon steel, taper pin going through the bar and double ended cutter to hold same in central position.

Holes and flange of guide can be used to hold guide in position. A regular No. 4 drill ratchet can be used, or work can be done on a radial drill with little difficulty.

When setting bar, after baffle plate on head has been removed care should be taken to have it central with the original bore.

Steel bushings are made with flange on one end and counter-bored on opposite end to allow for riveting after bushings are drawn in.

WRINKLE NO. 36

HOW TO PREVENT WELLS HOLDING OFF

P. W. BLACK, UNITED NATURAL GAS CO., SHIPPENSVILLE, PA.

A great many places, where we have pumping outfits at gas wells, we have had trouble with the wells holding off, i. e., they will not start to pump until after the valves are bumped together. This is caused by vacuum between the valves.

We have eliminated this trouble by taking a small three cornered file and filing a small leak in the seat of the travelling valve.

I have tried this at several different wells and find that it works very successfully.

WRINKLE NO. 37

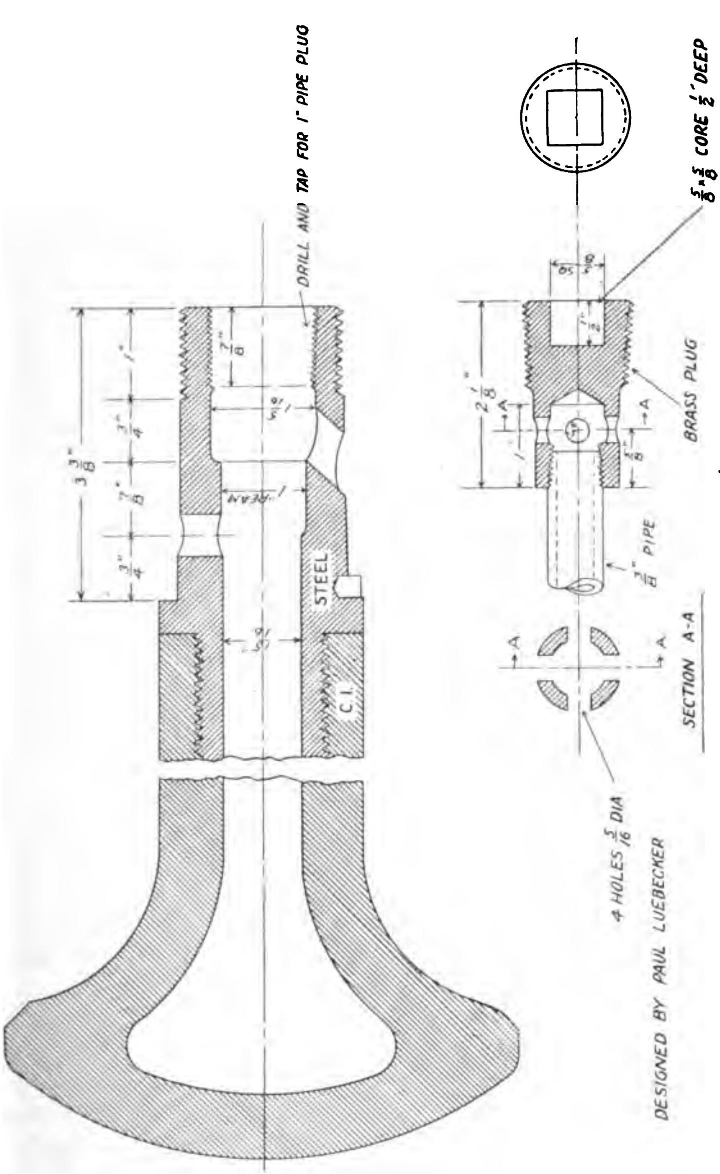
IMPROVEMENT ON EXHAUST VALVE COOLING WATER CONNECTIONS ON WESTINGHOUSE 23½ x 48 INCH TWIN TANDEM GAS ENGINE

P. LUEBECKER, THE MANUFACTURERS LIGHT & HEAT CO., WHEELING, W. VA.

Improvement consisting in boring and threading end of stem and inserting a brass plug in which ⅜" pipe is screwed.

It will be noticed in sketch that the brass plug is of special construction, but easy to make, if cast and left about ½" long on large end, in which a ⅝" x ⅝" x ½" hole is cored. This will allow the plug to be turned, bored and threaded in one chucking and can then be cut off to proper length.

The end of valve stems which are solid in original construction are bored and threaded to receive the brass plug (one inch standard pipe thread.) The small end of plug to be about 1" to fit reamed hole in stem, free but not loose. It will be found after ⅜" pipe is inserted in plug, it will swell the end of plug some, and should be measured before inserting plug and pipe.



Wrinkle No. 37

This arrangement has worked out very satisfactory, and has saved us the trouble of taking exhaust valves apart when the water circulation in exhaust valve has stopped, which often occurs, especially during flooded or high water periods. Anyone who has ever had the pleasure of taking one of the ⅜" pipes out of the stem without using profanity deserves a medal.

WRINKLE NO. 38

LEAK CLAMP FOR LOW PRESSURE SYSTEMS

ARTHUR J. McCLELLAN, MFRS. LIGHT & HEAT CO., PITTSBURGH, PA.

There are many types of leak clamps on the market and fully as many "home-made" designs. The outstanding features of the clamp illustrated is, first—its low cost of production; second—the extreme simplicity of the parts used, and thirdly—its adaptability for stopping leaks of any size. The saddle can easily be cut from scrap pipe and to dimensions to fit the leak. The illustrations show more clearly than words how the clamp is applied and the appearance of the parts needed.

WRINKLE NO. 39

CARE OF WATER COOLED ENGINES

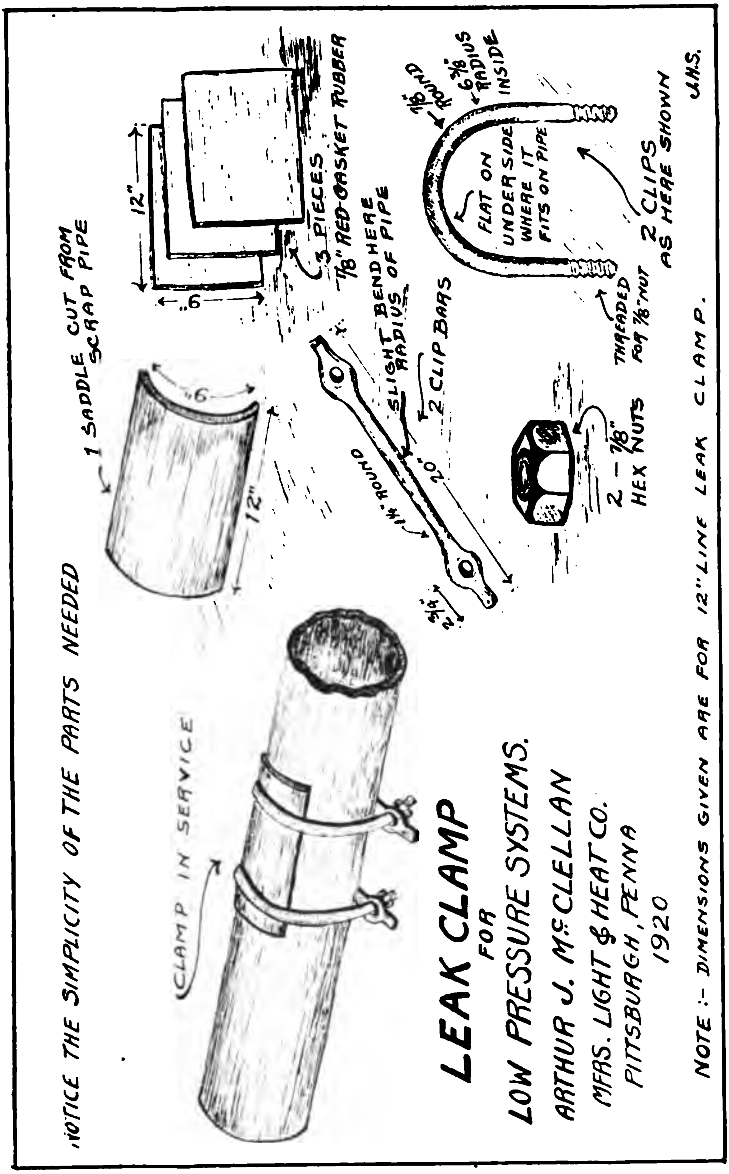
FLOYD BLACK, UNITED NATURAL GAS CO., SHIPPENSVILLE, PA.

At many of our wells where water cooled engines are used, we often find very poor water; in many instances it is either alkali or salt water that is available for cooling the engine.

This water has a bad effect on the engine; causing it to corrode and clog up. We have found by experimenting that the best way to eliminate this trouble is to run two or three gallons of crude oil thru the jacket a couple of times each year.

A water cooled engine should never be run long enough to cause it to become heated, before water is turned into it.

By observing the above, I find that the water cooled engine will last longer and will render much better service.



Wrinkle No. 38

WRINKLE NO. 40

TOOL FOR RE-BORING VALVE SEAT FIT ON EXHAUST VALVE CASINGS

Paul Luebecker, The Manufacturers Light & Heat Co., Wheeling, W. Va.

This tool is used to re-bore fit-in exhaust valve casing, which is often necessary, when seat becomes corroded, and out of round, which makes it impossible to fit a new seat without

Wrinkle No. 40

first re-boring the casing. This operation can be done with little difficulty, and in a short time, without even removing exhaust valve case from engine, by using a longer bar as shown in photo.

The steel bar was made from ordinary machinery steel, the arm was made from an old clutch lever, which was shortened up. A ⅝″ x 1¼″ slot cut in with set screw to hold tool in position, usina ⅝″ square tool with an adjusting wedge. Wedge

can be raised or lowered by using shims, tool can be adjusted to any size required for this operation.

The bushing shown on stem is a regular exhaust valve stem bushing, which is driven into case, and acts as a guide for boring tools, also valve, stem, guide and bearing. Drill ratchet or hollow ratchet wrench can be used.

The ring shown on picture is one of the valve seats used on Snow Gas Engine.

WRINKLE NO. 41

REMOVING FOUL GAS FROM METERS WHEN TESTING

T. J. SIMMS, MFRS. LIGHT & HEAT CO., PITTSBURGH, PA.

During the 'in test' of meters the gas remaining in the meter is discharged into the meter room and which may affect the health of the workmen. To overcome this trouble a special test check is needed and also a hose to lead the foul gas outdoors by way of the window or ventilator. The test check is tapered to allow it to be easily adjusted to the discharge hose. Further comment is unneccessary. See drawing.

WRINKLE NO. 42

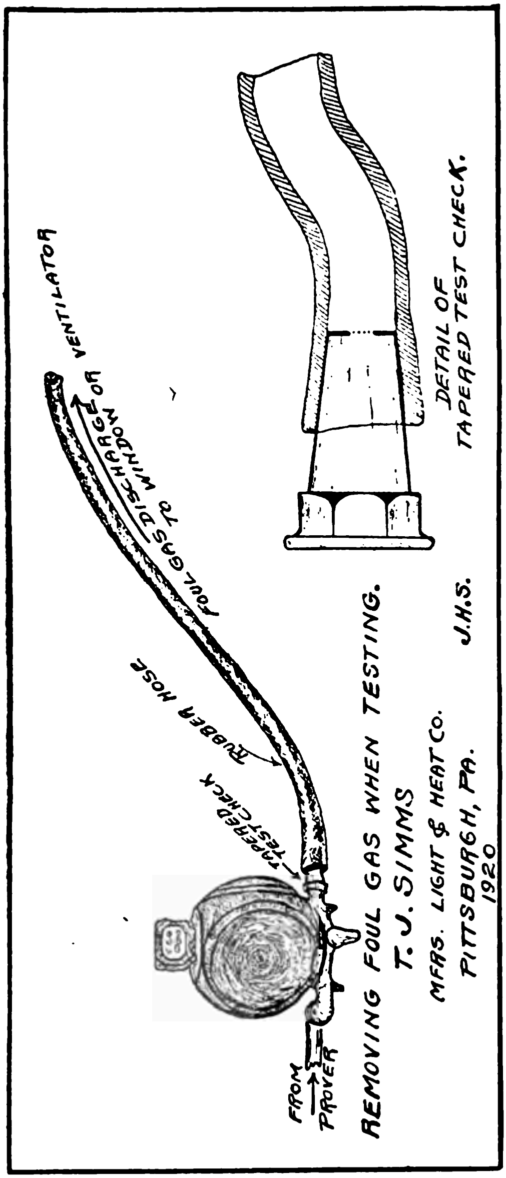
MAKE STENCIL ON ADDRESSING MACHINE FOR ALL RECORDS

R. S. CHEATHAM, FORT WORTH GAS CO., FORT WORTH, TEXAS.

Considerable annoyance can be caused by a slight difference in the various records pertaining to one account.

The contract man usually makes the original record and rush of work causes him to write indistinctly at times. Later records are handled by different clerks and the results are sometimes very unsatisfactory. Very often the ledger will show one name, the stencil another slightly different, and the deposit or other records still another.

Where individual loose leaf is used this can be remedied by the use of a stencil on the addressing machine. The stencil can be cut showing any desired information such as name, ad-



Wrinkle No. 41

dress, deposit number and amount, meter number and reading, order number and date. All records including ledger sheets are then printed on the addressing machine.

If the stencil is checked to insure its correctness it gives the assurance that every record in the office pertaining to the same account is identical, and correct in every respect. Considerable time can be saved and the expense of handling the work greatly reduced.

WRINKLE NO. 43

AUTOMATIC CONTROLLER FOR LOW PRESSURE DISTRIBUTING REGULATOR

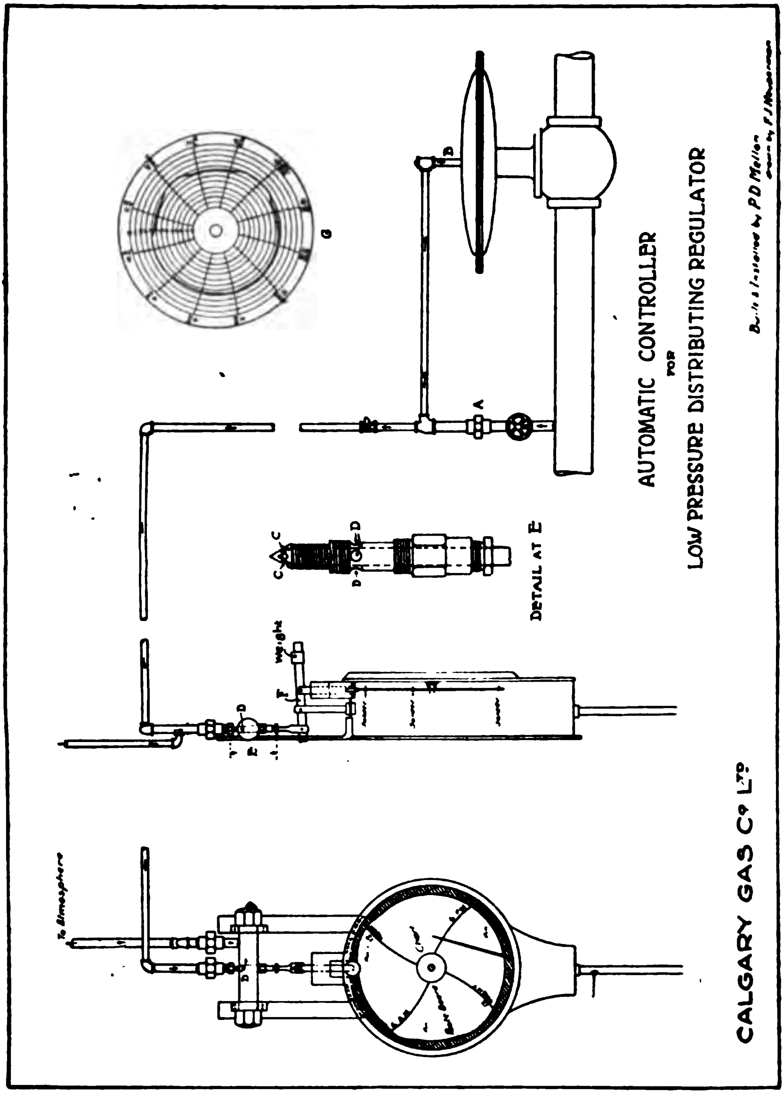
P. D. Mellon, Calgary Gas Co., Calgary, Alberta, Canada

In order to deliver an even pressure into the consumer's premises in districts where the gas pressure is controlled solely by regulating stations, it is necessary to raise or lower the pressure at certain times, by putting on or taking off more weights. This is usually done by hand.

This operation may be performed automatically. The writer has designed and installed a miniature Regulator made out of a needle valve taken from a Clark Jewel Range. This Miniature Regulator is securely mounted on the top of the recording gauge in the Regulating Station, and Regulates the amount of gas that is let into the diaphragm of the District Regulator.

To accomplish this, the union *A* and the nipple *B* are both plugged with lead through which small orifices are drilled, the gas entering the equalizing pipe, encounters the orifice *A* which partly stops the flow. After passing through orifice *A* it is again partly stopped at the orifice *B*. It then seeks the line of least resistance, and flows up through the 3/8″ pipe to the miniature Regulator, where it enters through the holes *C* and discharges through the holes *D* into a 1″ manifold, where it finally escapes through a 1/4″ pipe to the atmosphere, or into the outlet side of a dead weight safety pop valve.

The amount of gas that passes through the miniature Regulator is controlled by a pasteboard chart, which replaces the aluminum face. This chart is so cut that the small sheave wheel,



Wrinkle No. 43

which is attached to the lever *F* of the miniature Regulator, rises and falls as it rides on the chart, which revolves with the clock.

The recording chart is held in place on the pasteboard chart by small pins which are attached by a drop of solder.

To safeguard the distributing Regulator against too sudden a rise or fall in pressure, a dash pot attached to the lever is recommended.

Figure G shows a 24-hour record of the pressure as regulated by the Miniature Regulator.

WRINKLE NO. 44

REGULATOR VALVE GRINDING HANDLE

J. J. BUCHANAN, MFRS. LIGHT & HEAT CO., PITTSBURGH, PA.

Valves of old style high pressure regulators have been successfully ground by the aid of the simple handle here illustrated. The handle is easily and quickly constructed and furthermore, it is very cheap. The sketch shows the parts required. The dimensions may, of course, be changed to suit the convenience of the repairman. Pin fastened valves can be ground by this style handle by substituting a nipple having a pin hole instead ot the threaded end.

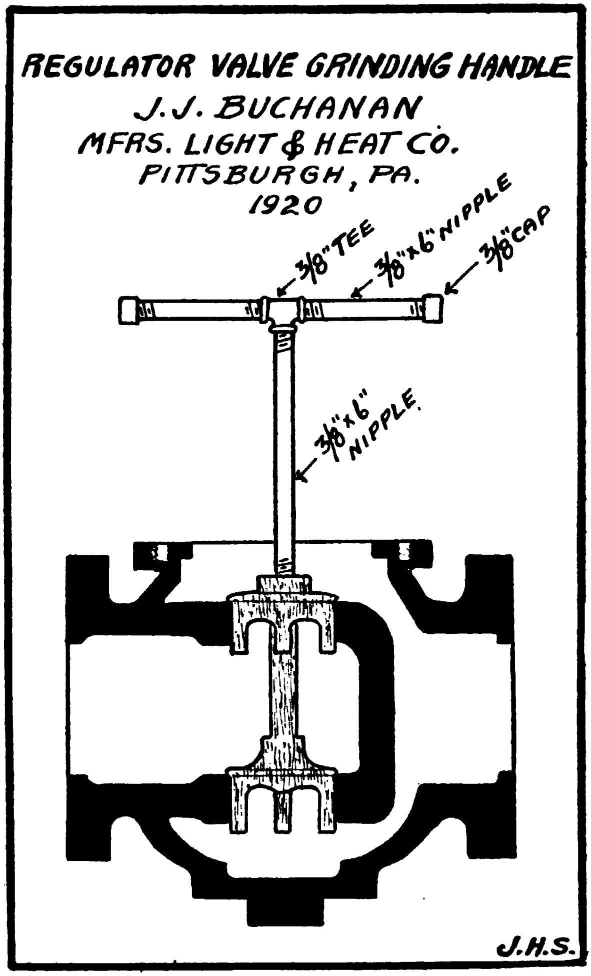
WRINKLE NO. 45

GAS WELLS ABANDONED BEFORE BEING EXAMINED AND THOROUGHLY TESTED

CHAS. E. GOBLE, UNITED NATURAL GAS CO., SHIPPENSVILLE, PA.

Very often good wells have been pulled and abandoned on account of cavings filling in over the sand; the cause of the falling off not being determined beforehand.

Before a well is abandoned, I think the proper thing to do, in all cases, is to run a steel measuring line to determine whether the well is filling in with cavings or not, thereby shutting off the gas.



Wrinkle No. 44

If there is no water in the well and it is perfectly dry, it is almost impossible to detect the fact that the well has filled in, without first running a measuring line.

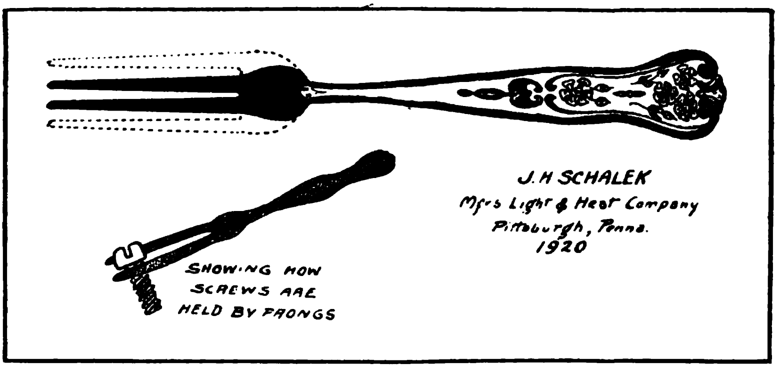
I have known of a number of cases in this section where wells have been filled in over 100 feet from the top of the sand and the gas shut off; the wells being abandoned without first determining positively the cause of the lost production.

WRINKLE NO. 46

SCREW PLACING TOOL

J. H. Schalek, Mfrs. Light & Heat Co., Pittsburgh, Pa.

This efficient little tool has been used in this shop daily for the past three years and has proven indispensable. It was originally devised for replacing cage screws in Keystone meters but we find during the course of our daily work that it is not



Wrinkle No. 46

limited to this meter alone. Try it out by using it for replacing Tobey meter index screws when it becomes necessary to change the change wheel. You will like this wrinkle for that purpose alone. Any fork that has seen better days and cheaper food will answer the purpose. Hammer the fork flat and cut off the outer prongs. File off the rough edges and you will have a tool that you wouldn't sell if you couldn't get another.

WRINKLE NO. 47

CLEANING OUT TOOLS

JOHN LEWIS, UNITED NATURAL GAS CO., SHIPPENSVILLE, PA.

When fishing for tubing or casing, many men in charge of the tools are often careless.

When it is found necessary to pull a packer and the hole is caving, or when the casing has been pulled out, or when you are pulling on tubing and it becomes parted a couple of hundred feet down, the first thing a cleaning out man should do is to figure his pipe correctly (figuring the screwage) and mark same down in his memorandum book, so when he is cleaning out on top of his tubing there will be no danger of damaging the top of the tubing so that a socket will not go over it.

If a stitched canvas belt is used, it should be oiled twice a year with pure linseed oil, for by doing this the life of the belt will be greatly extended.

A wire drilling line, or sand line, should be oiled, or Texaco dip used on it for every well that it is used, or at least every month or six weeks. By doing this, water will be kept from the core of the line and prevent it from rusting.

A man who is engaged in running a string of cleaning out tools should provide himself with a memorandum book and keep an accurate record of the size of every tool included in his string, i. e., length of tools, size of collars, size and make of box and pins. This will prove invaluable in case of a fishing job.

The joints of all tools should be oiled and covered when not in use. When you are fishing for pipe or tubing or other material, it is good policy to run an impression block. By so doing, the operator is enabled to determine the position of the pipe or tool.

In cleaning out old wells, it is often a difficult matter to tell just what is in them.

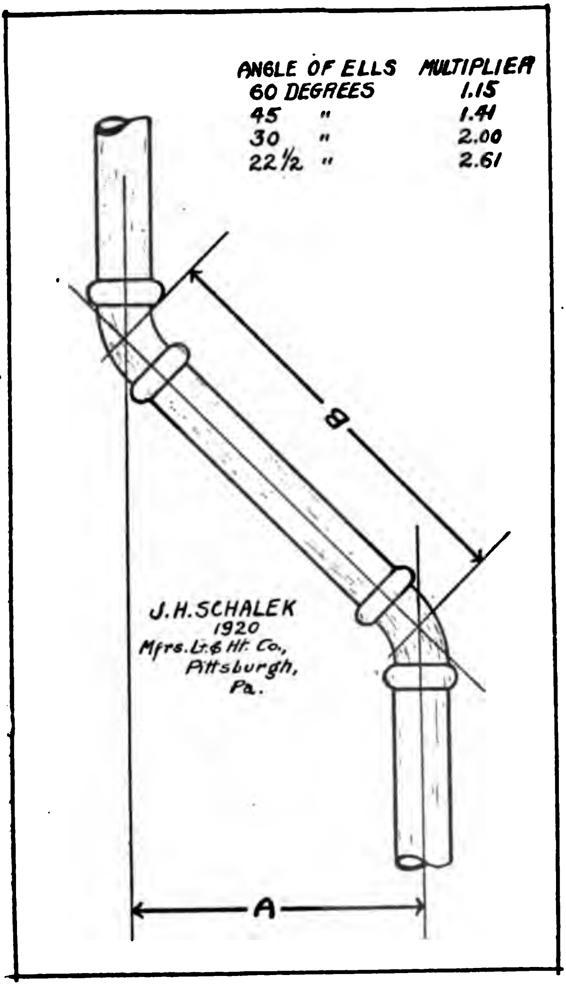
In order that better service may be obtained from a wire drilling cable used for cleaning out purposes, the cable should be turned, end for end, at least every two wells. It has been my experience that by so doing the cable will wear considerably longer.

WRINKLE NO. 48

A NEW ANGLE TO AN OLD QUESTION

J. H. SCHALEK, MFRS. LIGHT & HEAT CO., PITTSBURGH, PA.

Obstacles in the path of a proposed piping system, are not, as some would believe, the cause of the obstreperous good humor



Wrinkle No. 48

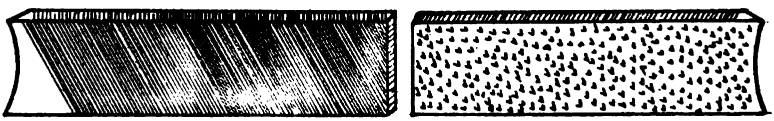
of the average fitter. If the obstruction is irremovable, circumvention must be resorted to as we say in Pittsburgh. This is sometimes best accomplished by the use of two 45 degree ells as pictured in the accompanying sketch. So far everything is as simple as Simon but the question that elopes with the fitter's goat is: "How will I find the length of pipe 'B'?" Some use a stick, some a tape line. Sometimes, however, you may look in vain for either of these two articles. Seldom is an engineer's bible the trusty companion of the fitter. Should he possess one he will find, in the chapter devoted to "Triangles and the Whyfores of their convulsions", the knock 'em dead formulae that look like a troupe of circus acrobats in the midst of their juggling act. Here is a method that answers the fitters' query and in which only infant arithmetic is employed. The only information needed is the distance 'A' and the angle of the ells used. Directions: Multiply the distance 'A' in feet or inches, according to conditions, by the multiplier for the angle of the ells employed and—that's all. Paste this in your hat—it's a most useful wrinkle.

WRINKLE NO. 49

SCRAPER FOR CLEANING COLLARS AND SADDLES

D. W. Brown, The Manufacturers Light & Heat Company, Beaver Falls, Pa.

An old rasp, cut in half, and each half sharpened like a half circle, makes a good tool for cleaning pipe before putting on saddles, or handy tool for cleaning collars before clamping.



Wrinkle No. 49

WRINKLE NO. 50

PROTECTION TO PRODUCING SANDS

MR. G. A. KENNEMUTH, UNITED NATURAL GAS CO., SHIPPENSVILLE, PA.

In a well where it is necessary to recase, pull the packer, or abandon the well, whether the well is packed or not, and it is thought that if water is allowed to come in contact with the producing sands, that it will have a damaging effect upon the sand, if a Robinson bridge of the proper size is set below the casing, or in case the well is packed with 3 or 4 inch pipe, if a 3 or 4 inch bridge, a sthe case may require, is set at the proper point and a small piece of burlap is placed on top of the Robinson bridge, and a few pieces of stone and some drillings put in the well, you will not be troubled with water flooding the sand.

WRINKLE NO. 51

ACCOUNTING DEPARTMENT COMPLAINT

F. F. ROBERTS, THE MANUFACTURERS LIGHT & HEAT COMPANY, PITTSBURGH, PA.

Attached blanks illustrate an especially convenient form of inquiry and reply between the Accounting and Operating Departments. Made out in triplicate, two copies going to the party who is making investigation, third copy remaining in General Office.

This form of complaint is used only in connection with inquiries pertaining to errors in field, distributing or other office reports and is separate from regular form of complaint slip used in connection with complaints from consumers.

Does away with typewritten letters; gives both the complaint and explanation in regard thereto on same sheet; makes less papers to be filed in vouchers, and from the carbon copy, it is possible to compile a record of such complaints issued during a month, year, or other period. Has many advantages and been in practical use for some time.

THE MANUFACTURERS LIGHT & HEAT CO.

COMPLAINT

No.........

Audit Department, Pittsburgh, Pa.........................19....

......................Dept.

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Agent or Foreman

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Investigate and report at once..

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Treasurer or Auditor

...............Date................19....

In reply ....

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Agent or Foreman

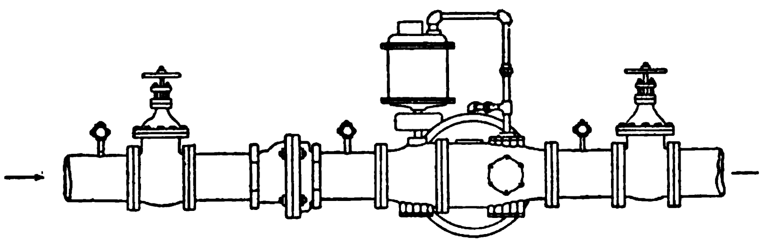
INSTRUCTIONS: This form is sent you in duplicate. Original to be filled out as promptly as possible, giving information as requested, and returned to General Office. Duplicate with carbon copy of reply to be kept by you for your files. If transfers are being made for corrections, *Give Consecutive Nos.*

Wrinkle No. 51

WRINKLE NO. 52

PROPER MANNER OF INSTALLING CHECK VALVE ON FIELD METER CONNECTIONS

Bud Wise, The Mfrs. Light & Heat Co., Cameron, W. Va.



Wrinkle No. 52

The drawing submitted seems to tell its own story without words.

It gives a suggestion for installing check valve on field meter connections.

WRINKLE NO. 53

TO PREVENT PLUGGING OF STANDING VALVES

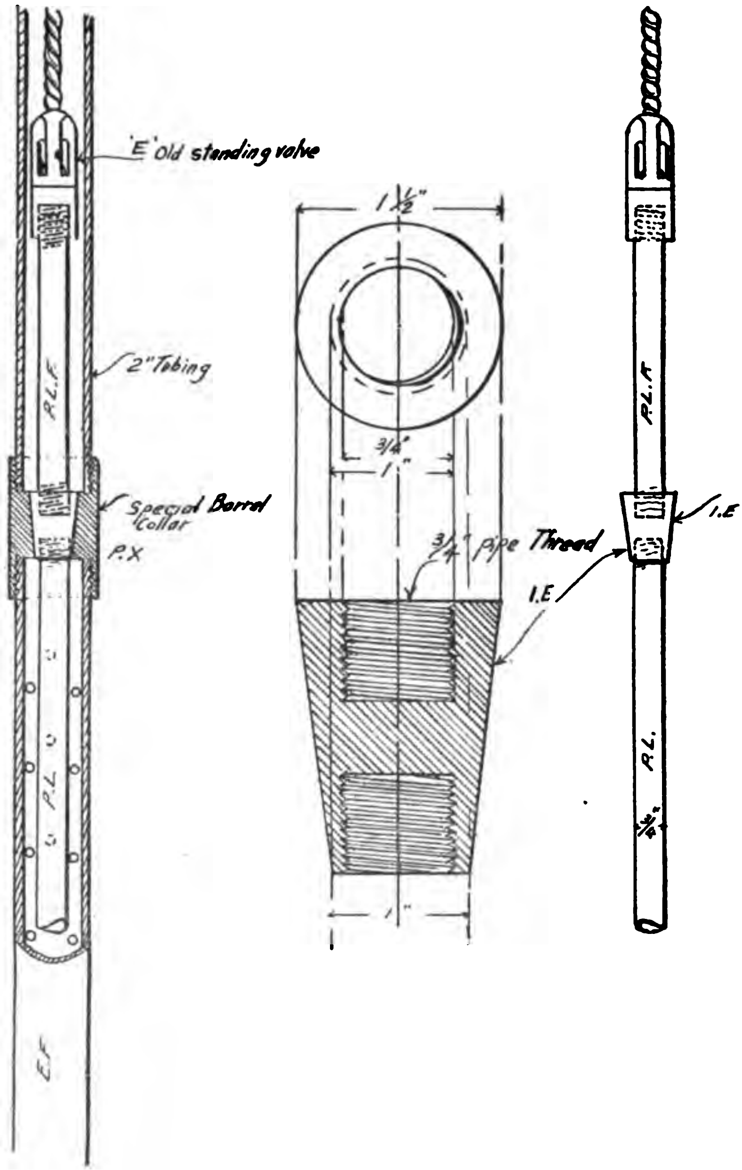
S. H. Phillips, Mfrs. Light & Heat Co., Hundred, W. Va.

The sketch shows a wrinkle used on wells giving bother from gas or sand or cups plugging standing valves. This acts as a gas anchor and sand trap and standing valve as well.

Fig. 1 shows it seated in barrel in position.

P-L ¾" pipe to extend 2' below perforation.
P L F ¾" pipe 2' long extends into working barrel.
I E is piece to fit into barrel collar P X and threaded to receive ¾" pipe.
E is old standing valve body without leathers.

Fig. 2 can be removed any time without pulling tubing and be replaced in tubing in well any time.



Wrinkle No. 53

WRINKLE NO. 54

CARE OF STOP COCKS ON WELLS AND LINES

MR. G. A. KENNEMUTH, UNITED NATURAL GAS CO.,
SHIPPENSVILLE, PA.

It is my opinion that the majority of stop cocks that are found broken on wells and lines, have become so on account of not having been properly oiled.

This is especially true in cases where stop cocks are installed on high pressure wells and lines and where it is necessary to tighten the nut on the core of the stop cock to make it hold.

When a stop cock has been closed for some time, and which was not properly oiled when installed, it is almost impossible to open it without hammering it, with the result that the stop cock is often broken.

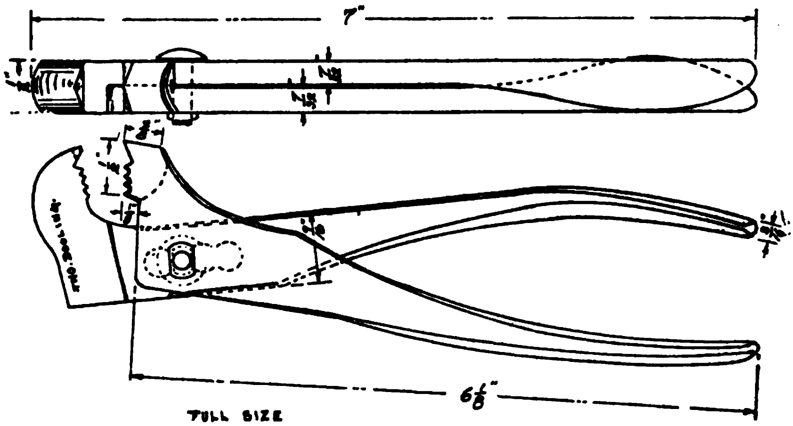
This trouble can be eliminated by oiling all stop cocks about every six months. I would recommend that Mica axle grease or Arctic cup grease be used.

To prevent a great loss of gas owing to lines breaking, it is advisable to install a check valve on every gathering line, where it leaves a main line or crosses a river or creek, as I recall several instances where gathering lines have been broken by falling trees, and by the use of a check valve we have saved our company considerable expense in not having to drain the main line.

WRINKLE NO. 55

PLIERS FOR SMALL PIPE

JOHN DOOLING, THE EAST OHIO GAS COMPANY, CLEVELAND, O.



Wrinkle No. 55

WRINKLE NO. 56

PURCHASING DEPARTMENT TRACER

R. W. HAY AND F. F. ROBERTS, THE MANUFACTURERS LIGHT & HEAT COMPANY, PITTSBURGH, PA.

It frequently occurs when invoices are received from supply houses for materials shipped to various field points, that all or a portion thereof has not been received, owing to transportation company or other delays.

The attached form illustrates a simple and practicable method of keeping Accounting and Purchasing Departments and supplying companies, informed as to this condition and is of material assistance in effecting prompt delivery.

It is made out in triplicate by the Accounting Department, one copy being forwarded to the Purchasing Agent, one copy to the supplying company and the third copy remaining on file in the Accounting Department, with invoice attached.

The supplying company investigates and reports its finding

on the lower portion of the blank and returns to Purchasing Agent, who, in turn, reports to Accounting Department.

If delay occurs, Accounting Department can refer to original notice and follow up by number.

Should material be located before report is received from supplying house, the lower portion of blank is filled out by Purchasing Agent and forwarded to the proper party.

Does away with typewritten letters. Affords good record and is readily filed with invoice when inquiry is completed.

PURCHASING DEPARTMENT

THE MANUFACTURERS LIGHT & HEAT COMPANY

COLUMBIA BANK BUILDING

Pittsburgh, Pa. ....

....
....
....

The following material shipped on our order No................ to us at........................., care of .... as per your invoice dated........................, amount $........... has not been received to date: —

....
....
....

Kindly have this shipment traced at once and advise us promptly on form below your action in the matter.

Yours truly,

THE MANUFACTURERS LIGHT & HEAT CO.

Purchasing Agent

....

....
....

Referring to notice dated.......................regarding material on order No.................., invoice dated................., amount $..............., beg to report as follows: —

....
....
....

....

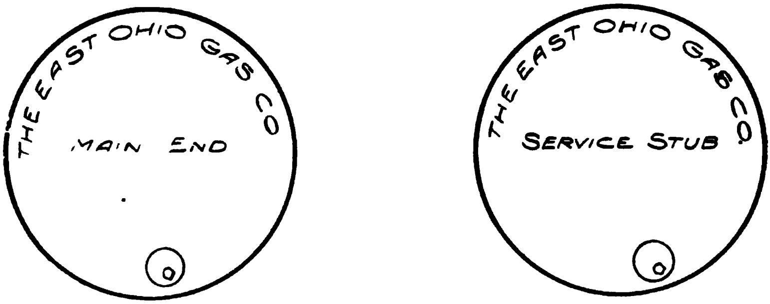
By.....................

Wrinkle No. 56

WRINKLE NO. 57

CURB BOX COVERS FOR LOCATING ENDS OF MAINS AND SERVICE STUBS

M. J. Young, East Ohio Gas Co., Youngstown, Ohio.



Wrinkle No. 57

If the lids as shown in the above sketch are made so that they fit on a regular style box, it is possible to locate both the main line end and the service stub end which is laid on streets in advance of paving without confusing them.

WRINKLE NO. 58

LIGHT FOR USE IN MAKING LINE REPAIRS AT NIGHT

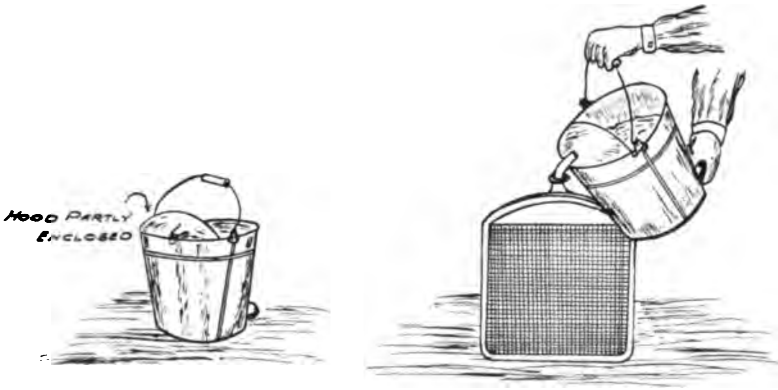
A. E. Shepard, The East Ohio Gas Co., Youngstown, Ohio

An automobile spot light or an automobile headlight to be connected into headlight socket of a Ford or other automobile by a wire extension, on one end of which is the light, and on the other the plug for fitting the socket; the wire to be approximately 30 feet long, and a special box to be made to hold the wire and spot light when not in use.

WRINKLE NO. 59

BUCKET FOR FILLING THE RADIATOR OF AN AUTOMOBILE

M. J. Young, The East Ohio Gas Company, Youngstown, O.



Bucket For Filling Radiator

Wrinkle No. 59

This bucket will eliminate the spilling of water when filling a radiator and by its use an automobile can be filled much easier.

A bucket similar to the one in the attached could be manufactured at a small cost over the price of an ordinary bucket.

WRINKLE NO. 60

GAS MASKS FOR GASOLINE PLANTS

R. P. Anderson, United Natural Gas Co., Oil City, Pa.

The type of gas mask that consists merely of a face piece and a breathing tube, long enough to reach from the wearer to a source of pure air, is valuable around natural gas gasoline plants, especially in examining the unloading values of tank cars used for gasoline shipments.

Regulation army gas masks can be adapted for this purpose at very small cost. It is merely necessary to disconnect the rubber tube and canister from the face-piece and attach a piece of

hose of the desired length incorporating the valve at the bottom of the canister, or a similar valve, in the connection between the hose and the face-piece to prevent breathing out through the hose.

WRINKLE NO. 61

TOOL FOR TESTING DIAPHRAGMS IN TOBEY METERS

JOHN MACDONALD, UNITED NATURAL GAS CO., BRADFORD, PA

Base of meter is removed and rubber pad of tool shown in drawing is placed over diaphragm port in body of meter.

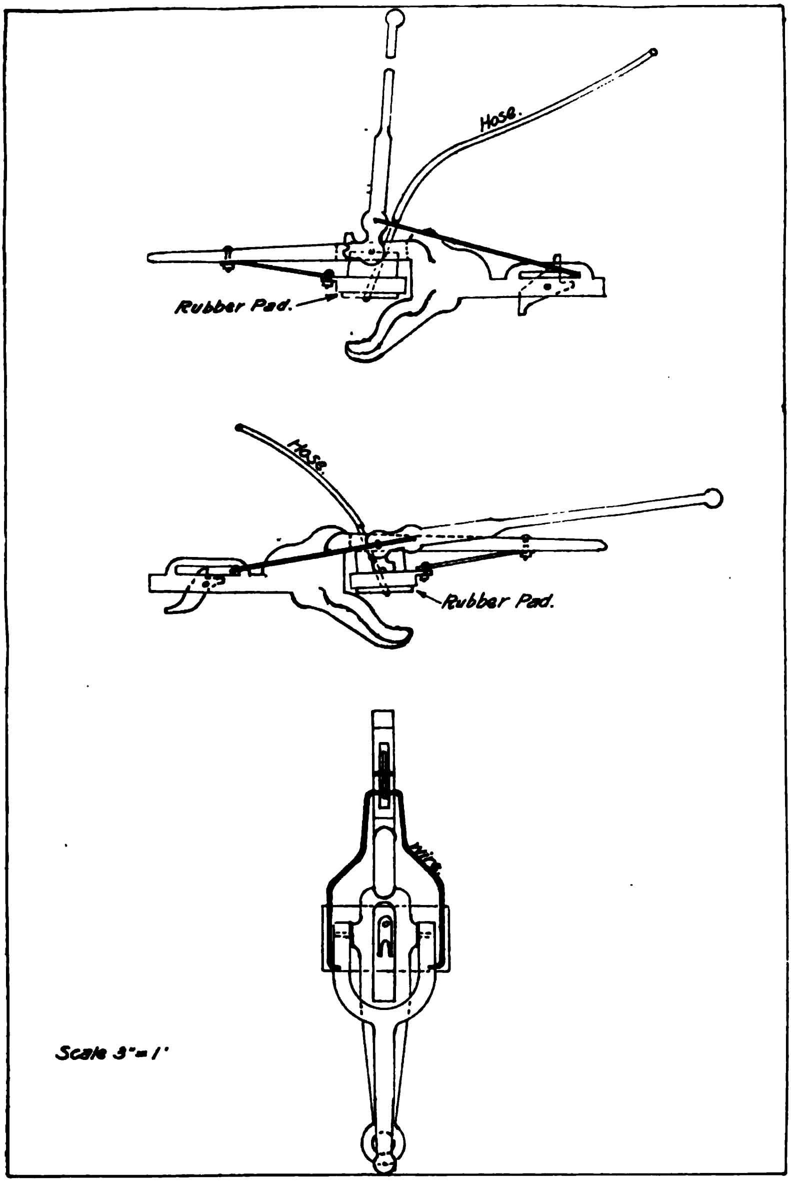
When lever handle is pulled down, rubber pad makes a tight seal. Hose is connected to arch gauge. We make test of diaphragm for leakage by putting 3 inches water pressure between diphragm and cover. If diaphragm is defective, same will show up on arch gauge and size of leak will be indicated by special time clock.

WRINKLE NO. 62

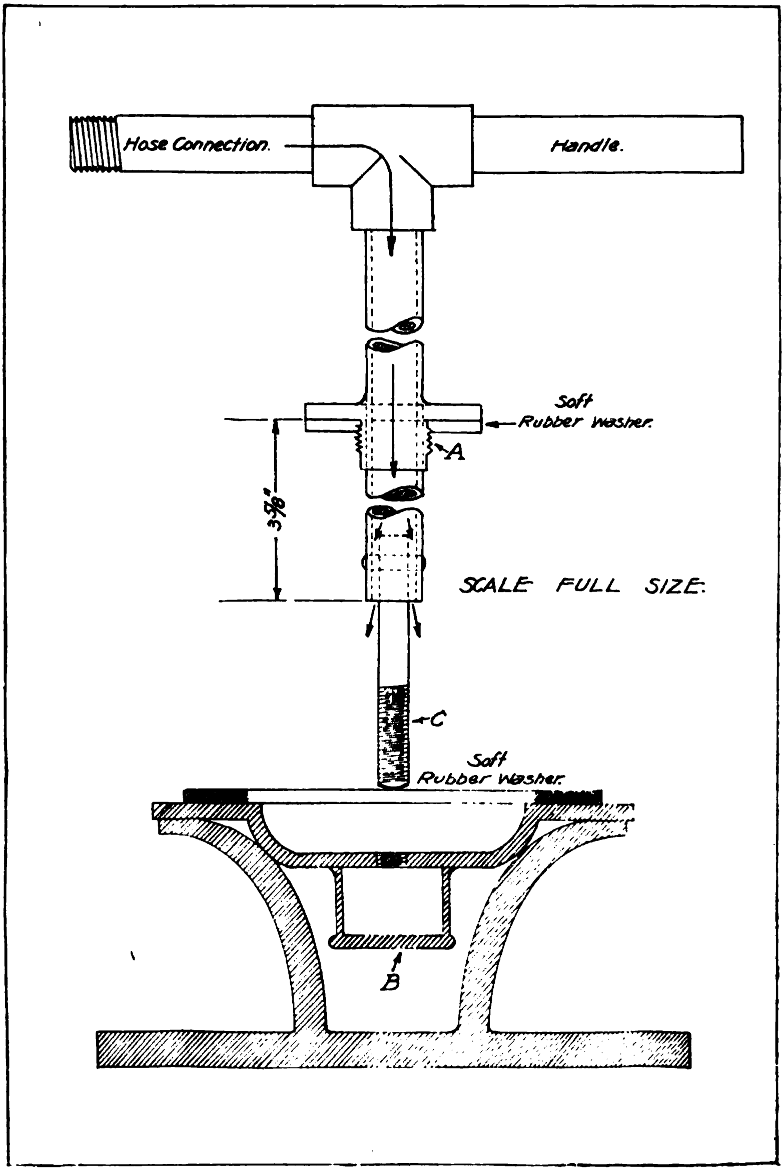
LET METER READERS BLOW A WHISTLE TO ANNOUNCE WHO THEY ARE

IRA B. REED, IROQUOIS NATURAL GAS CO., BUFFALO, N. Y.

Why not provide meter-readers with a special whistle having a peculiar (yet pleasing) tone all its own that people will soon learn to determine as that of the "gas-man". The letter-carrier is so equipped and the baker's wagon, etc. It seems to me if meter-readers were so equipped the percentage of "outs" and "re-reads" would be greatly lessened and that less delay would be experienced in gaining admission to residences. The whistle could be heard for several houses ahead and the man would not be kept waiting; timid women would be more likely to give admission whereas they would not come to the door for what appeared to be a stranger. I also believe this would lessen disputes as to whether or not meters are "read from the curb" and people would know that their meters are read and when.



Wrinkle No. 61



Wrinkle No. 63

WRINKLE NO. 63

IRONCASE DIAPHRAGM TESTING TOOL

F. C. Hanchett, United Natural Gas Co., Titusville, Pa.

A simple and handy tool to use in connection with arch gauge and timber clock, in testing Ironcase A and Ironcase B meter diaphragms, when removed from meter is shown in drawing.

Gas inlet nipple is inserted through diaphragm disc brass box at same time bolt "C" in end of nipple passes through diphragm disc clamp. Screw diaphragm disc on at "A" and cover "B" on bolt "C". This will hold diaphragm in an open position, so it can be inflated as desired.

WRINKLE NO. 64

COMBINATION SEALING IRON AND WIRE CUTTER

D. L. Flynn, United Natural Gas Co., Oil City, Pa.

I submit a drawing suggesting a wire cutting device in connection with the commonly used meter sealing iron, where lead seals are fastened by the use of copper or tinned water.

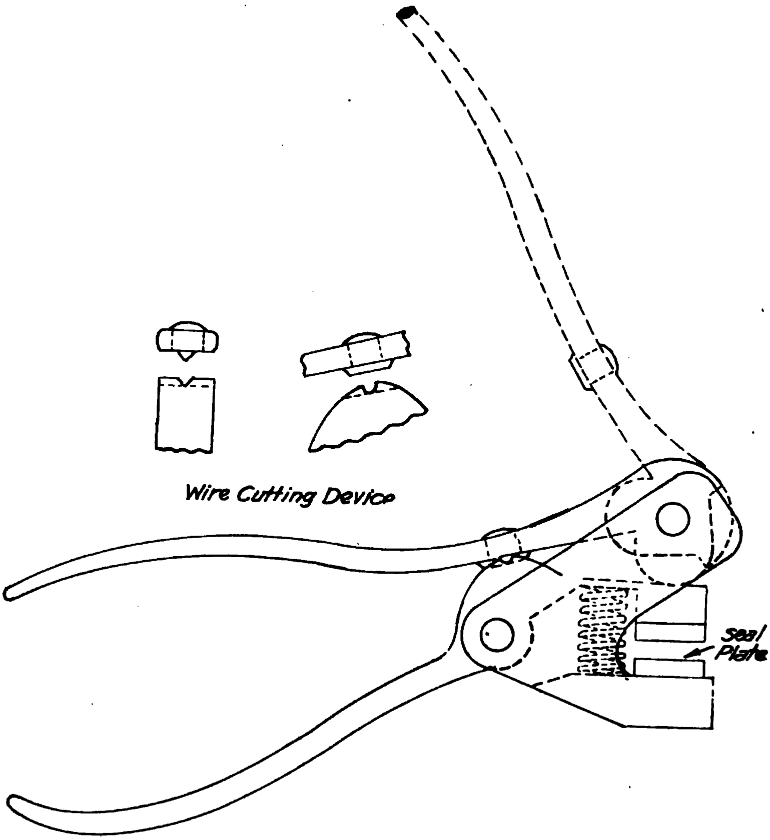
This new tool might be called a Combination Sealing Iron and Wire Cutter.

WRINKLE NO. 65

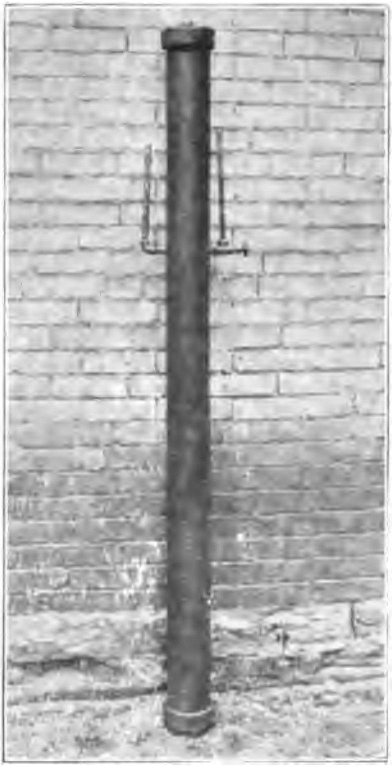
INDICATOR FOR SHOWING HEIGHT OF OIL IN SAFETY TANKS

J. P. Curry, United Natural Gas Company, Sharon, Pa.

In the photograph is shown two different styles of indicators, one being an angle globe valve with glass tube to show height of oil in safety tank when globe valve is open. The other is simply a 3/8" pipe tapped into side of safety tank. By running gauge rod in the 3/8" riser, depth of oil in safety tank may be determined.



Wrinkle No. 64



Wrinkle No. 65

WRINKLE NO. 66

GAUGE FOR TAKING DIFFERENTIAL TESTS ON ALL METERS

C. E. Pratt, The Equitable Gas Co., Pittsburgh, Pa.

This wrinkle is submitted from The East End Shop, Equitable Gas Co.

This is a simple Gauge for taking differential tests on all kinds of meters. It consists of a copper box of peculiar shape with a single glass tube and a scale as shown. It is easier to read than a U Tube, as you read one water mark only.

By simply attaching the rubber tube connected to meter inlet

to hose connection on the box, and the rubber tube connected to outlet to hose connection on glass tube, you have a very quick and accurate reading.

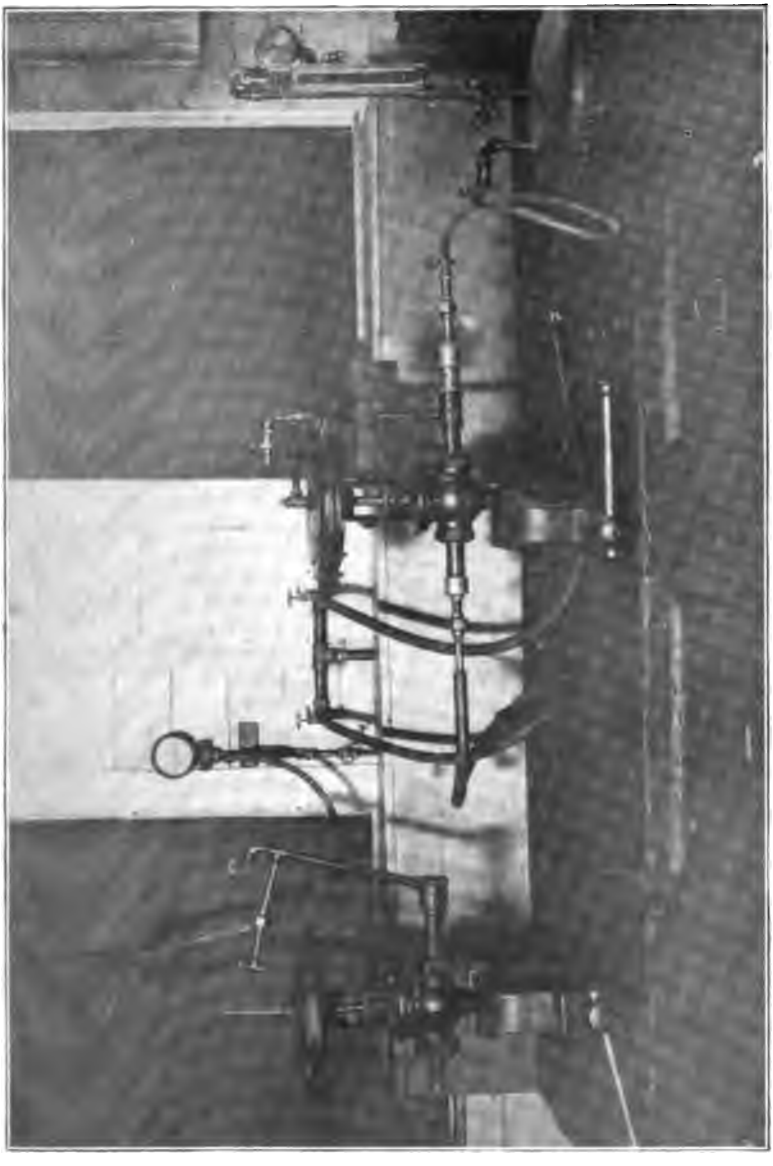
Wrinkle No. 66

WRINKLE NO. 67

OUTFIT FOR TESTING REGULATORS IN SHOP

R. W. Ward, United Natural Gas Company, Oil City, Pa.

See the photograph. The left hand regulator shows test being made of a diaphragm for leakage, by using a 5 lb. spring gauge instead of an arch gauge. Two lbs. pressure is turned on upper side of diaphragm through hose. Stop then closed below, and if the gauge shows enough drop in one minute to indicate diaphragm is defective, same is then taken out and replaced.



Wrinkle No. 67

On right hand side of photograph is shown test of regulator being made for valve leak. With 40 or 50 lbs. pressure on inlet, regulator is set to feed at 5 ounces pressure. Outlet is connected to small tank to act as cushion. When feeding at 5 ounces through this tank, outlet of tank is closed, and if pressure does not run up more than 2 ounces, regulator valve seats are considered in good condition.

WRINKLE NO. 68

METER SETTER AND FIRE CALL MAN SHOULD CARRY SMALL FIRE EXTINGUISHER

A. J. MITTENBULER, THE CITIZENS GAS AND ELEC. CO., LORAIN, OHIO

I would suggest that the meter-setting truck be equipped with a small fire extinguisher, not only to protect the truck, but mainly in case of accident such as a leak catching fire.

A man could do a lot of execution while the fire department was on the way.

In answering fire calls a trouble man is many times right in the neighborhood of the fire, and a moment at the start is worth hours ten minutes after.

WRINKLE NO. 69

BOOKKEEPER'S BILL FILE MADE FROM DEFECTIVE METER VALVES

J. J. BUCHANAN, MANUFACTURERS LIGHT & HEAT CO., PITTSBURGH, PA.

Having on hand a lot of defective Tobey meter valves I conceived the idea of using them as bases for bookkeepers' bill files. These files may be made very easily by cutting off the boss, drilling a hole through the top to hold the rod and filling the cavity in the valve with lead or solder.

The lead increases the weight of the file and makes, in addition to a bill file, a very useful paper weight.

Wrinkle No. 69

WRINKLE NO. 70

SOME GAS COMPANY OFFICE WORK COULD BE DONE AT NIGHT BY OUTSIDERS

M. J. ADAMS, THE FORT WORTH GAS CO., FORT WORTH, TEXAS

The letting out of office work by contract for performance at night has many advantages. Capable men can be secured at nominal cost from the ranks of business college students, law students, or others whose work is of a semi-professional nature and does not require close application during regular business hours.

We have tried this method in handling posting of cash collections to individual accounts in consumers ledgers. It has the following advantages:

1—*It avoids confusion and congestion of workers.* By the usual method, the posting requires that clerks handling same make entries in practically every ledger every day and, as many of these ledgers are in the hands of bill clerks, change clerks, balance clerks and collection clerks, there results delay and waste of time on the part of all. Night work is done at a time when ledgers are available.

2—*It gives up-to-the-minute records.* Our collection department can tell at eight o'clock in the morning just who is delinquent and can send collectors out promptly. An hour and a half is saved daily in this department by the new method. The contract department also benefits in making final settlements with customers.

3—*It requires less equipment.* Fewer desks, adding machines, etc. are required as the night force use desks and equipment used by other departments in the day time.

4—*It reduces labor worries.* By contracting by the job with one man who hires and controls his own helpers, you fix responsibility for getting the work done. At the same time, you eliminate on that operation any shortage of help due to sickness, excuses, leaves of absence, etc. of employees as the contractor will require his available force to work longer or he will do the extra work himself and at no extra expense to you.

5—*It costs less.* In the above mentioned operation, we reduced the cost 20% due to the fact that the same amount of work can be done in fewer hours at night when there are no interruptions and all ledgers are available.

This same principle can be applied to other parts of the office work to good advantage, taking care that in case two or more different operations are to be performed at night there be no conflict between them which would neutralize some or all of the advantages of this method.

WRINKLE NO. 71

DAY AND NIGHT SHIFTS OF CLERKS WILL ACCOMPLISH MORE WORK

R. S. Cheatham, Fort Worth Gas Co., Fort Worth, Texas

Clerks handling different parts of the clerical work interfere with each other to a considerable extent. This is caused by their needing the same equipment, ledgers or other records at the same time and can be easily remedied by working two shifts.

The day shift usually works from eight to five. It is a very easy matter to get another set of clerks who will come to work at from five-thirty to seven and work two to four hours according to the needs of the business. These people are usually experienced office people who want to make extra money.

Any two parts of the work which interefere can be put in different shifts and the results usually prove very satisfactory. The work can be performed in less time and in a more efficient manner.

WRINKLE NO. 72

WHEN WORK GETS BEHIND TRY THIS NIGHT WORK PLAN

R. S. Cheatham, Fort Worth Gas Co., Fort Worth, Texas

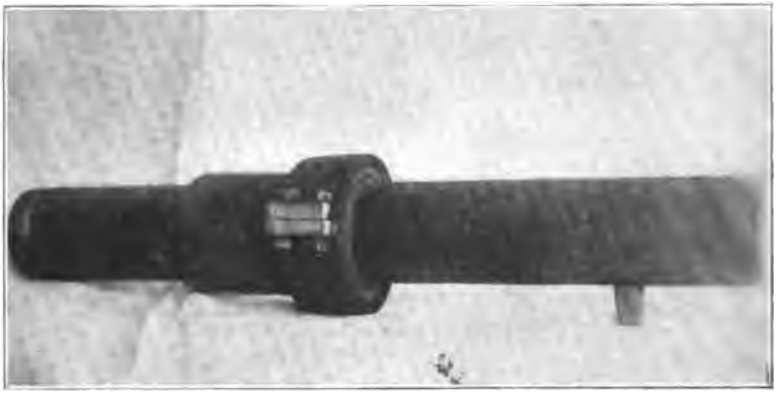
When work gets behind it seems almost impossible to catch up, but we have satisfactorily solved this problem. A certain part of our office work which is handled by one clerk recently got twenty days behind. We figured the exact cost per unit for getting this work done and made a trade with a few of our best people to do the work on a piece basis overtime.

In a week's time the work was up to date without any apparent ill effects on the clerks. Owing to the work being done after hours when there were no interruptions they were able to earn $1.00 per hour or better and now stand ready to help out anytime we get behind.

WRINKLE NO. 73

QUICK WAY TO REPAIR LEAK WHERE THREAD HAS BEEN PULLED IN COLLAR

GEO. OFFENBACHER, THE OHIO FUEL SUPPLY CO., COLUMBUS, O.



Wrinkle No. 73

We use a heavy wrought iron or steel clamp, made as shown in the photograph. This is clamped tightly over the collar, leaving sufficient recess space extending over the pipe in order that lead may be caulked into the recess.

This makes a good gas tight repair similar to and just as good as the recess fittings usually sold.

WRINKLE NO. 74

FORM USED TO PREVENT MISTAKES IN ACCOUNTS

R. S. CHEATHAM, FORT WORTH GAS CO., FORT WORTH, TEXAS

Some clerical mistakes are made and the accounts become so "balled up" that when they are cold it is almost impossible for the person correcting them to know just what happened.

To assist in overcoming this and give us a permanent record of all corrections involving two different accounts we now have a Transfer (T. R.) Slip, a copy of which is submitted. It will

be noted that this printed form debits one account and credits another, with space for explanation and signature of party making the correction.

We find this of great help.

AMOUNT $............ No. ....

DEBIT CREDIT

FOLIO..........LINE.......... FOLIO..........LINE..........

NAME........................ NAME........................

Give full explanation: ....

....

....

SIGNED ....

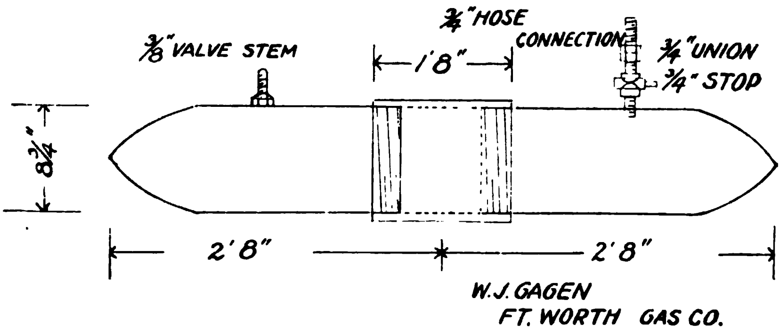
Wrinkle No. 74

WRINKLE NO. 75

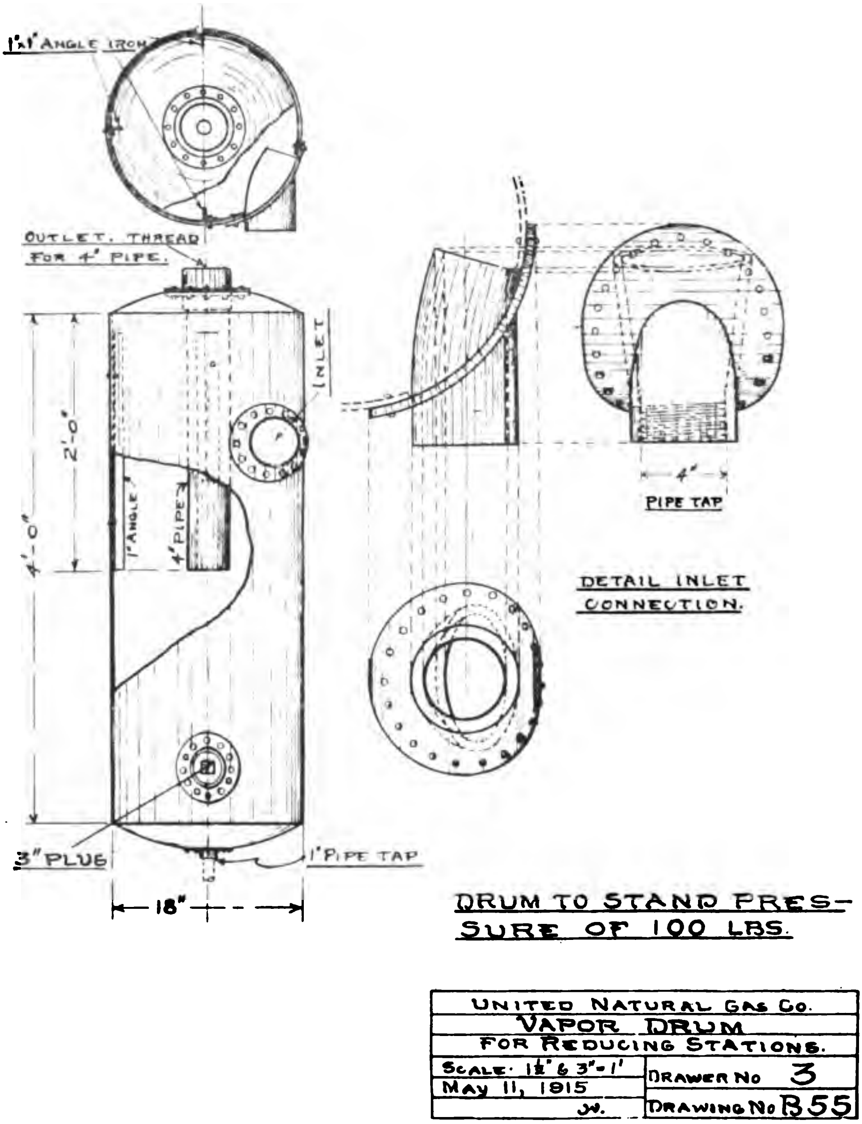
FORCE PUMP FOR CLEARING SERVICE LINES

W. J. GAGEN, FORT WORTH GAS CO., FORT WORTH, TEXAS

The device used for clearing the service lines is shown and explained by the drawing.



Wrinkle No. 75



Wrinkle No. 76

WRINKLE NO. 76

TANK FOR CATCHING FLUID OR VAPOR

FOREMEN, UNITED NATURAL GAS COMPANY, OIL CITY, PA.

Drawing No. B-55 shows a fluid or vapor catching tank, where gas is saturated with moisture of any kind.

WRINKLE NO. 77

DRAWING SHOWING COUNTRY REGULATOR AND METER MOUNTING ON HIGH OR MEDIUM LINE

FOREMEN, UNITED NATURAL GAS COMPANY, OIL CITY, PA.

Drawing No. A-81 shows our County Regulator and Meter Mounting, where we tap our medium or high pressure line for the purpose of accommodating Country Applicant for gas. The tap is always made at the main line where regulator and meter are set and (large) line from the outlet side of the meter to the place where gas is to be consumed is laid.

In addition to what is shown on this picture we always use our No. 1 oil sealed safety tank on the outlet of the meter.

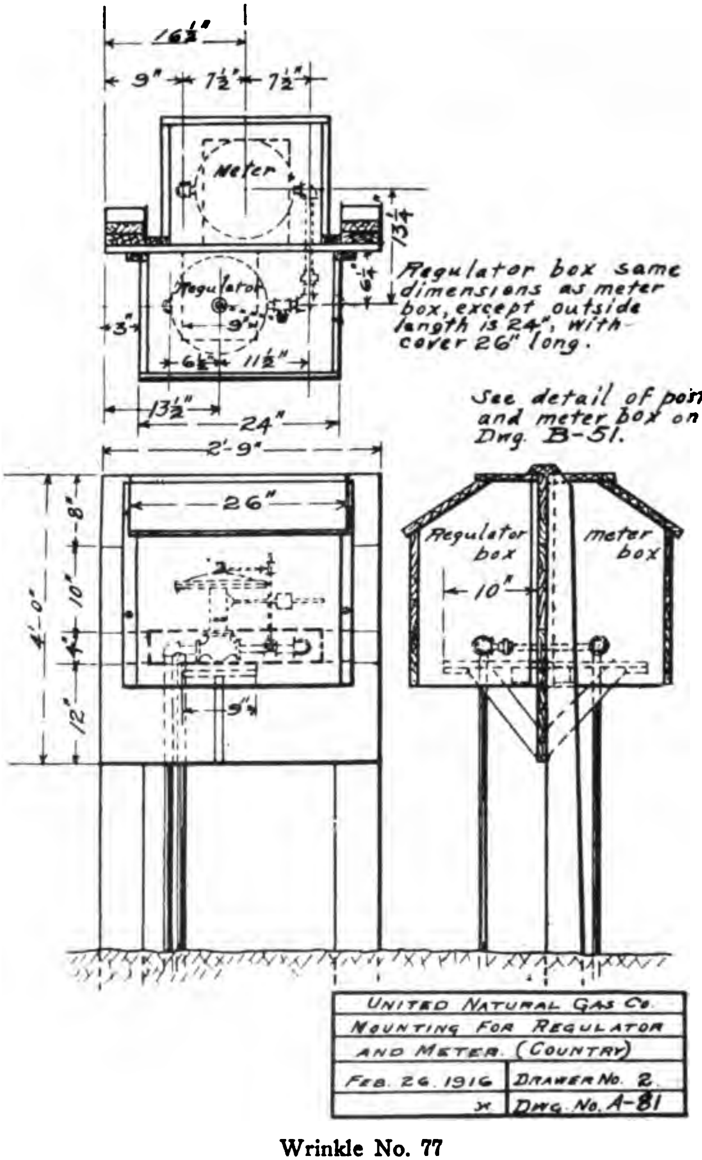
WRINKLE NO. 78

CRATE USED FOR SHIPPING TOBEY METERS

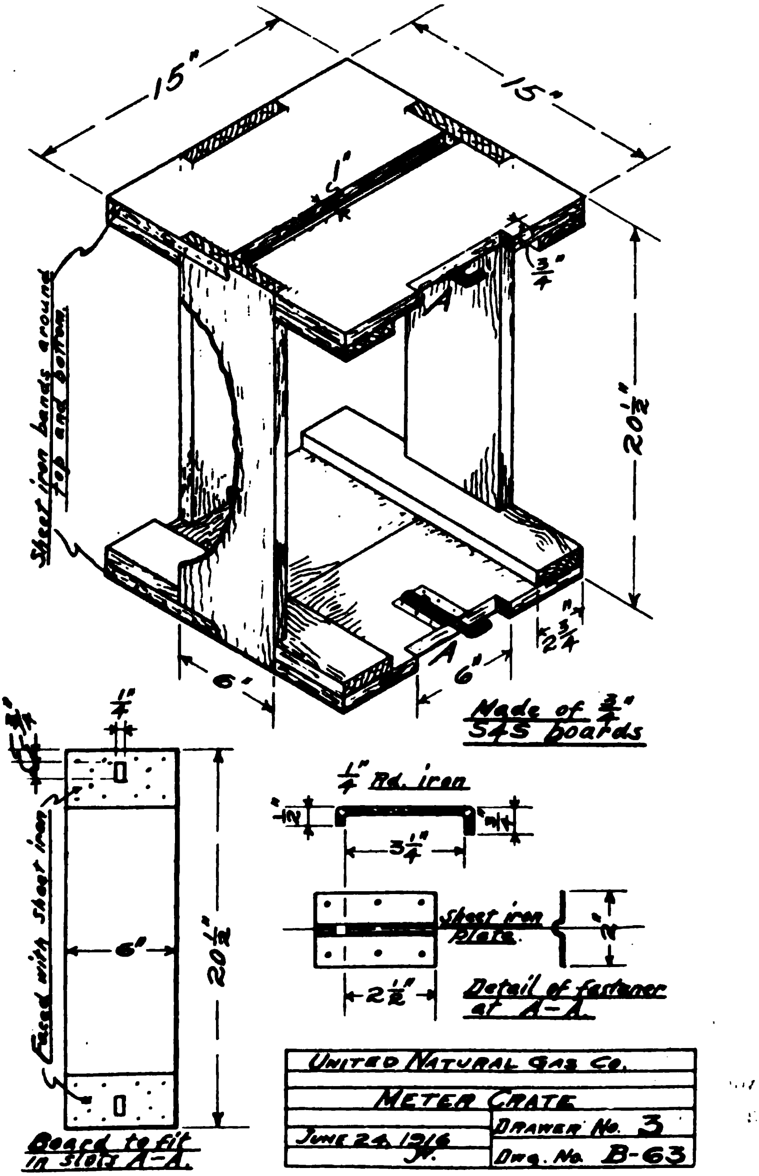
FOREMEN, UNITED NATURAL GAS CO., OIL CITY, PA.

Drawing No. B-63 is a crate for shipping Tobey meters either by truck or train back and forth between meter repair shop and country districts where no repair shop is maintained.

Where the handling of freight is rather rough this box or crate can be reinforced, otherwise it answers the purpose as shown.



Wrinkle No. 77



Wrinkle No. 78

WRINKLE NO. 79

PROPER CARE OF PIPE IN STOCK AND IN USE

J. J. Kane, United Natural Gas Co., Ormsby, Pa.

All pipe that is piled in any warehouse yard should be gone over at least once each year and thoroughly oiled, not only should the threads be oiled, but the entire joint.

It has been my experience that pipe will show evidences of wear quicker when it is piled at a warehouse yard than if laid in a line and in use. This is particularly true where pipe is piled near a railroad, where passing locomotives will throw a spray of smoke and cinders upon it, and which seems to have a very damaging effect upon the pipe.

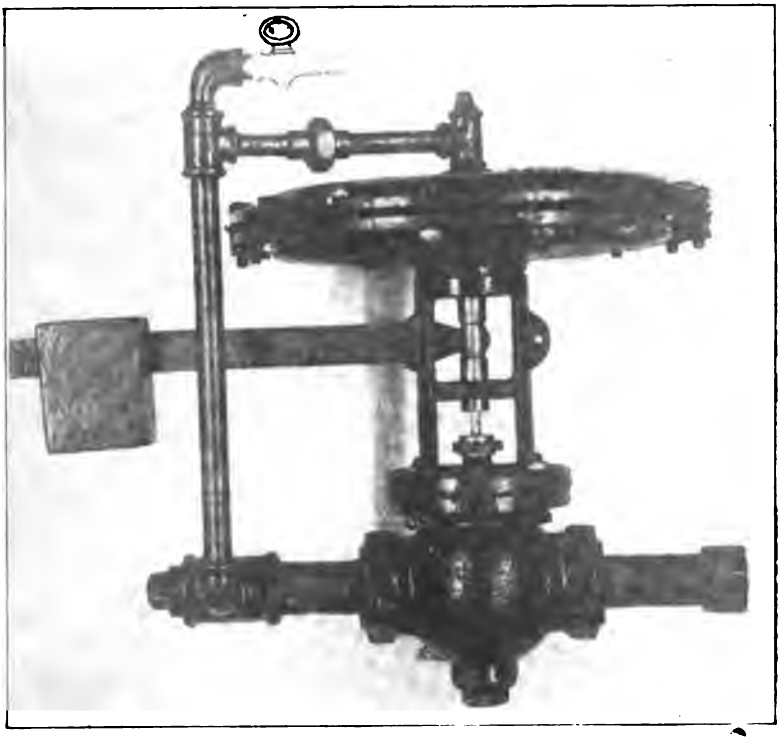
Where main lines run thru oil producing districts, and where salt water is being pumped upon the ground, I find it to be a good policy to uncover the pipe at intervals of from 300 to 500 feet to see if the pipe is scaling off, or is becoming pitted. In such cases, I would advise that the pipe be uncovered and a good coat of oil or tar applied to the joints, which will preserve the life of the pipe considerably.

WRINKLE NO. 80

GAUGE CONNECTION FOR TAKING PRESSURE ON INDIVIDUAL REGULATORS IN COUNTRY DISTRICTS

J. B. Porterfield, United Natural Gas Co., Oil City, Pa.

In our district, we have several hundred 1 x 1 Chaplin-Fulton house valves supplying individual consumers. We take pressure at stated intervals to see that pressure has not worked up higher than consumer is allowed. In order to have a handy connection to take pressure we have equipped all of our house valves with a common ⅜″ hose cock on the equalizing pipe as shown in the above cut. Our mercury gauges are equipped with a short pice of rubber hose.



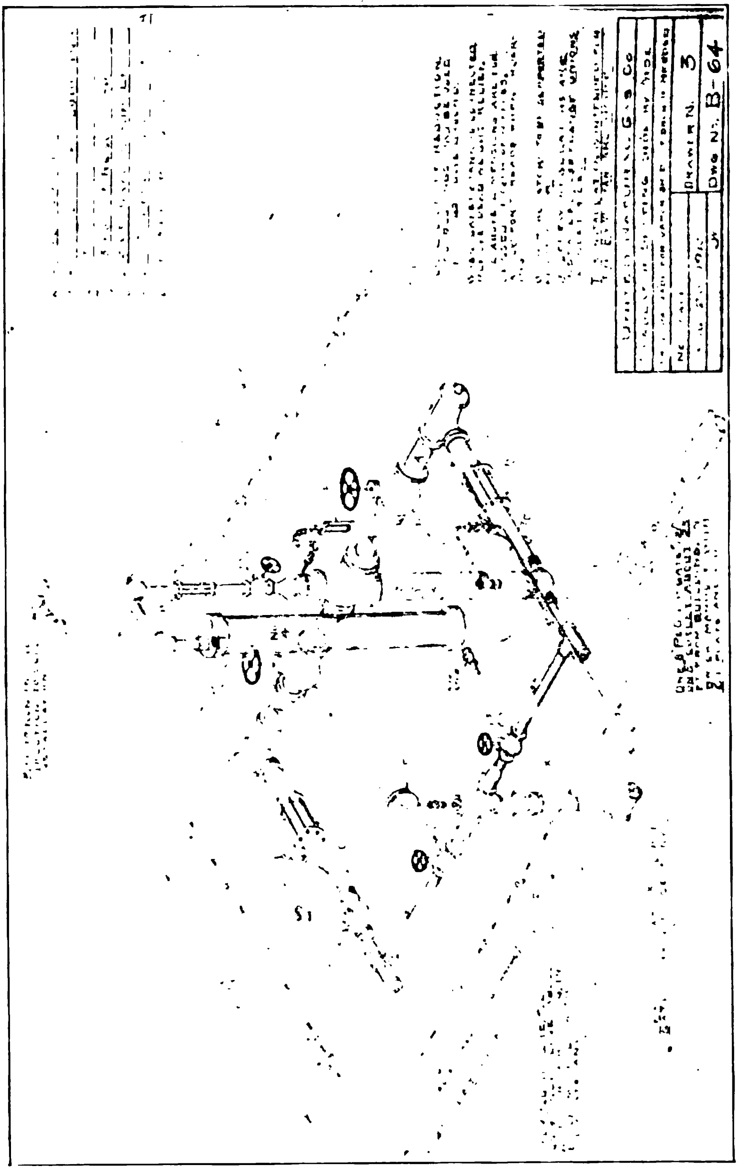
Wrinkle No. 80

WRINKLE NO. 81

DRAWING SHOWING METHOD FOR SETTING HEAVY REGULATORS

FOREMEN, UNITED NATURAL GAS CO., OIL CITY, PA.

Drawing No. B-64 shows one method of setting heavy regulators.



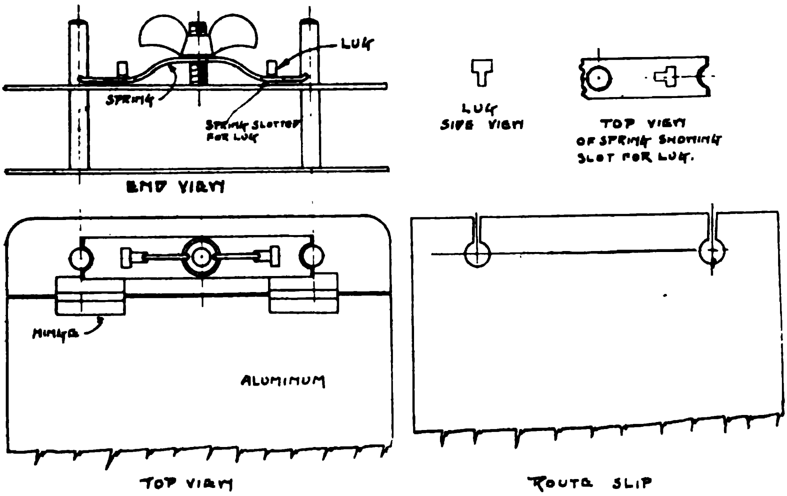
Wrinkle No. 81

WRINKLE NO. 82

CONVENIENT ROUTE BOOK FOR METER READERS

N. C. SAUERS, THE EAST OHIO GAS CO., CANTON, OHIO

I would suggest that a route book be made for the meter readers, over the print attached. This book will be convenient in putting in or removing slips, will make a better surface for putting in readings, thereby making the figures plainer. It will protect the slips in wet weather, and will last for a great length of time.



Wrinkle No. 82

Another idea to improve the present route book would be to place a 1/16" iron strip on the top and bottom of book, countersink the strip on the bottom and use common stove bolts for posts, and using common nuts to tighten down. The same slip could be used as is shown on the print attached.

WRINKLE NO. 83

BLOWING WATER FROM A WELL WITHOUT WASTING GAS

Clifford C. Lynn, United Natural Gas Company,
Shippensville, Pa.

I have had very good success, as long as the rock pressure was up to 350 pounds, or over, in running 3/4 or 1 inch pipe to the bottom of the well; perforating the bottom joint, and hanging the pipe in a stuffing box on well top, and connect the 3/4 or 1 inch pipe in ahead of the control stop at the well, and then blow the well into a drip or a cooler joint and no gas will be wasted.

This can be done where the line pressure does not exceed 100 pounds, but the higher the rock pressure, the higher the line pressure can be.

By shutting the control stop, and when the pressure has risen high enough, it will blow out thru the 3/4 or 1 inch and water can then be blown from the drip without waste of gas.

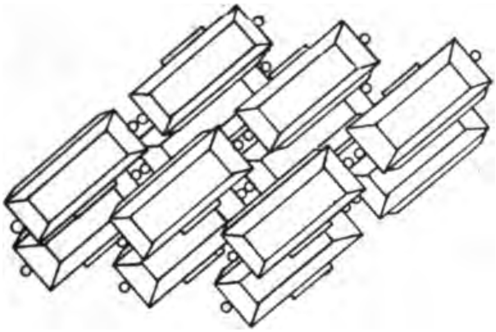
WRINKLE NO. 84

METHOD OF PILING METERS TO SAVE UNNECESSARY HANDLING

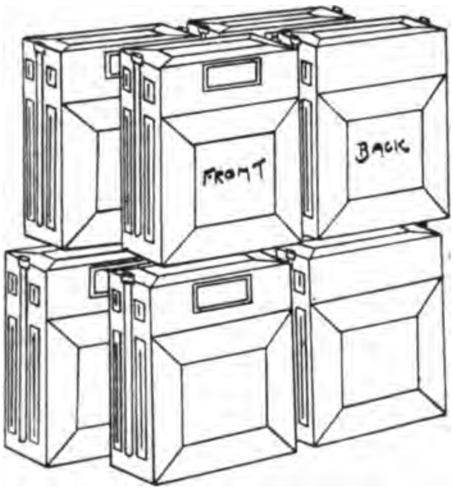
J. Sarbach, East Ohio Gas Co., Canton, Ohio

The method of piling meters, as shown in illustration is accomplished by simply placing meters diagonally, and facing columns in opposite directions, the front of meter facing outward, thereby causing dial and serial number to be in full view, at all times.

The benefit derived by piling meters in this manner is, that when monthly inventory is taken, or when one desires to check the state or number, it eliminates entirely the necessity of handling the meters, thereby saving much time and labor, and also lessens the probability of damage to meters by careless handling.



TOP VIEW



FRONT VIEW.

Wrinkle No. 84

WRINKLE NO. 85

FOLIOS ON ADDRESS SIDE OF POST CARD

E. J. Herbruck, East Ohio Gas Co., Canton, Ohio

Folios on the address side of gas card just before name, as sample will show, will eliminate much work when parties, after paying their bills, bring receipts to complaint counter for complaints, and also when receipts are brought in for record of payments, on regular or disconnect bills.

47 Mr. John Doe,
20 47 Rue St.,
Canton, Ohio

Wrinkle No. 85

WRINKLE NO. 86

LOW FIRE TESTING APPLIANCE

F. C. Hanchett, United Natural Gas Co.,
Titusville, Pa.

This may not be a new idea altogether, but a good one to be used where air is not to be had. The gasometer is used as a regulator on account of the accuracy of same in maintaining a very low pressure. Copper orifice is put in union on outlet of meter of known capacity of one foot of gas (not air) per hour at 2 inches water pressure. A small amount of cotton batting is put in nipples to prevent orifice becoming clogged. Cap is drilled with 5/32″ drill for outlet opening.

Wrinkle No. 86

WRINKLE NO. 87

SUCTION PIPE USED TO PREVENT WATER ENTERING LINE — SAVES GAS

FOREMEN, UNITED NATURAL GAS CO., OIL CITY, PA.

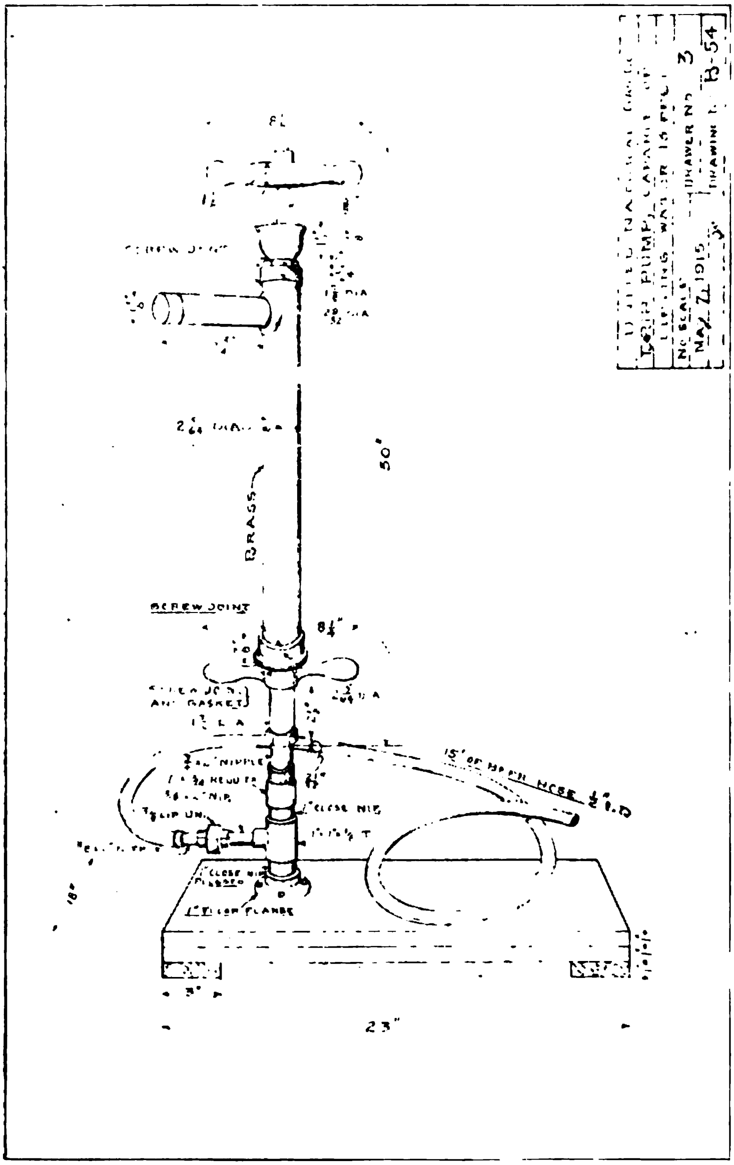
Drawing B-54, herewith enclosed represents a suction pump and rubber hose, which is used in drawing water out of our street lines through the regulation 1″ drip upright; until such time as leak is found and repaired, so that gas will not escape and water will not enter the line.

WRINKLE NO. 88

METHOD OF REPAIRING PIPE CUTTER

WM. McMILLAN, IROQUOIS NATURAL GAS CO., BUFFALO, N. Y.

The greatest wear on a Barnes 3-wheel pipe cutter occurs in the hook just back of the wheel pins. This wear causes the wheels to get out of alignment and the cutter is useless until a new hook is obtained. To avoid the expense of a new hook, we drill a larger hole for the pin, insert a bushing and replace the pin with a stud threaded on both ends. When it becomes worn again, all that is necessary is to renew the bushing.



Wrinkle No. 87

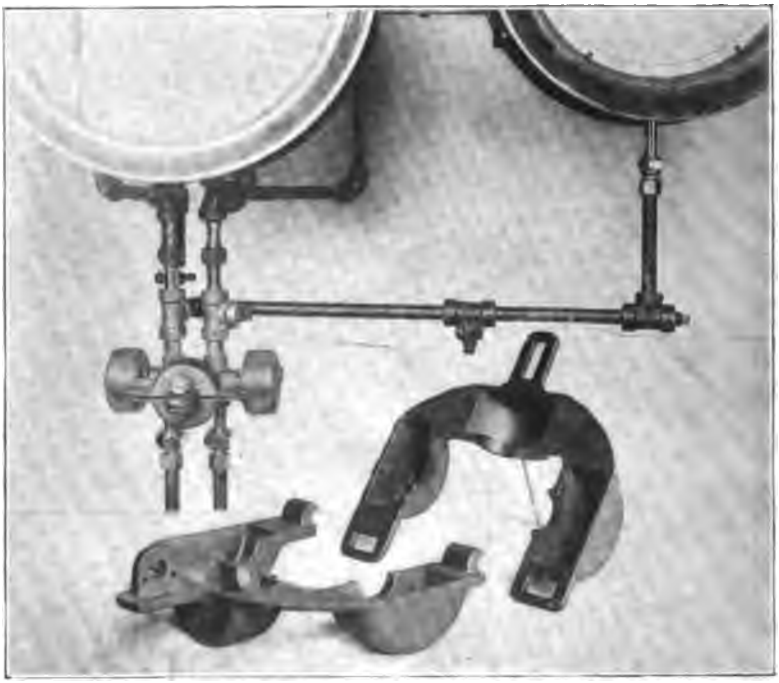
WRINKLE NO. 89.

ORIFICE METER SEALING DEVICE

T. H. Kerr, The Ohio Fuel Supply Co., Columbus, Ohio

The accompanying cut shows the application of a two-piece sealing device for Foxboro Orifice Meters. This device is very necessary where gas is being sold by orifice meters and where the meter has to be left in an exposed position. The interlocking clamp is provided with large and small holes so that it may be either locked or sealed together.

The merit of this outfit speaks for itself.



Wrinkle No. 89

WRINKLE NO. 90

TO PROPERLY REPAIR GATE VALVE SEATS AND RINGS

M. A. BIRMINGHAM, UNITED NAT. GAS CO., CLERMONT, PA.

We have successfully repaired all kinds of gate valve seats and rings, and have made a perfect joint which will not leak, by taking the gate valve apart and grinding the seats and rings in, with emery cloth attached to a wooden block, and made with a slot on one side, which we revolve from the high speed of the drill press.

We also find it necessary to saw off about ¼ inch from the lower wedge of the Ludlow gate valves to allow the wedges to expand further, in order to compensate for the amount of metal we remove by the grinding.

WRINKLE NO. 91

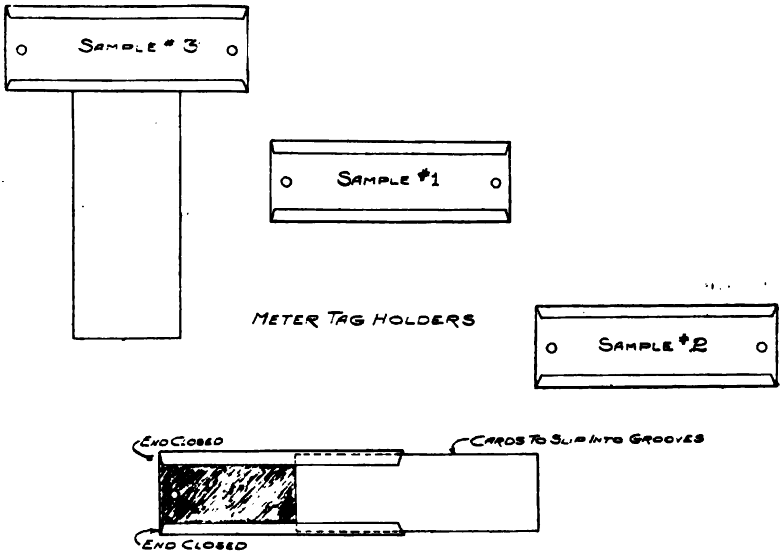
METER TAG HOLDERS

C. F. CLULEY, THE EAST OHIO GAS COMPANY, MILLERSBURG, O.

Sample number 1—Soldered to the holder that contains the test dates on a tin meter or tacked on a shelf supporting any kind of a meter.

Sample number 2—Attach as a tag to any kind of meter or pipe. The end being closed so that the card will not drop out.

Sample number 3—This can be attached to the head of a Tobey Meter where a Columbus or similar head seal is used. It can be slipped between the seal iron and back of the head and if desired bent upwards at mark on back so as not to be easily removed. If it were desirable to mark the tags in some permanent manner, it could be done by immersing the tag in hot paraffine thus making it damp proof.



Wrinkle No. 91

WRINKLE NO. 92

TESTING DEVICE FOR DOMESTIC METERS

T. H. Kerr, The Ohio Fuel Supply Co., Columbus, Ohio

In connection with the sending of inspectors to examine the setting and general arrangement of domestic meters to discover faults, it is very desirable to know the accuracy of the meters as well. This is especially true in towns which have been measured for leakage and gross gas lost.

By providing the inspectors with small meters which may be connected to the domestic meter as shown in the cut herewith, it is possible for them to determine the accuracy of the meters as well as the other conditions affecting them. Where the house piping system is tight and it is possible to reach to a hose connection in the house. it is not necessary to disconnect the outlet side of the meter and the test meter may be connected at this point.

Wrinkle No. 92

An inspector can make from twelve to twenty tests of this kind in a day, thus enabling the Maintenance Department to change the meters which are in trouble and avoid changing any number of meters which are operating correctly.

This method of procedure should mean a great saving to any gas company selling direct to the consumer.

WRINKLE NO. 93

SOCKET WRENCHES FOR TURNING ASBESTOS PACKED STOP COCKS

M. A. Birmingham, United Nat. Gas Co., Clermont, Pa.

We have successfully and cheaply made socket wrenches for turning asbestos packed stop cocks from old worn out 7/8 inch sucker rod boxes, by welding an extension on them and shaping them to fit the square on the cocks.

WRINKLE NO. 94

BOILER FEED WATER PRE-HEATER

W. E. WESTON, THE MANUFACTURERS LIGHT & HEAT CO.,
QUAY GASOLINE PLANT, WAYNESBURG, PA.

A considerable saving in fuel gas was effected at our absorption gasoline plants through the use of the boiler feed water pre-heater shown herewith.

A piece of old 12″ line pipe 7′ long is employed for the body of the heater, into which tube sheets drilled to accommodate 30 ¾″ tubes are welded about 1″ from ends.

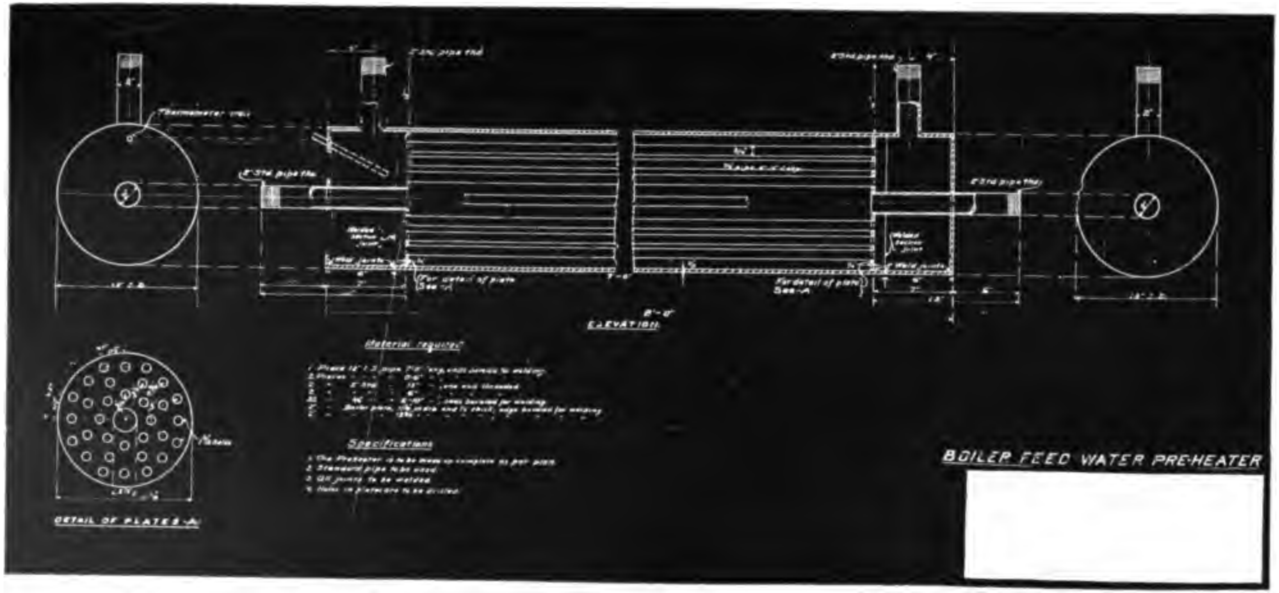
A piece of 2″ pipe 12″ long is welded in the center of each tube sheet for exhaust steam inlet and outlets, and extends through water chambers on each end, the latter being made up of a piece of 12″ pipe 6″ long with head welded in one end and then welded to main body of heater, a 2″ inlet and outlet for water is provided by welding a 2″ nipple 4″ long on the side of water chamber at each end.

The heater is mounted in a vertical position, water from the feed pump entering the side outlet at the bottom, circulating through tubes and passing out side outlet at top to boiler. Exhaust steam from pump enters at top and passes through space surrounding flues, the condensation passing out at bottom of heater.

This heater used in connection with the regular open type heater generally used in this work permits the handling of water at reduced temperatures by the pump from the open heater, thereby preventing excessive wear to pump valves due to handling extremely hot water, and results in a much higher temperature of water entering boiler than would be possible to handle through pump.

Water from the open heater enters pump at from 160° to 175° F. and after passing through pre-heater enters the boiler at from 212° to 230° F.

As our government, through the Secretary of Interior, is urgently advocating the conservation of natural gas by all the large gas companies as well as by consumers, our company is encouraging every effort on the part of its employees to assist



Wrinkle No. 94

in this direction, and this little wrinkle is submitted with the idea in view of helping the other fellow along with his conservation efforts.

WRINKLE NO. 95

PORTABLE FIXTURES AND TOOLS FOR BORING, FACING AND RELINING POWER CYLINDERS

PAUL LUEBECKER, THE MANUFACTURERS LIGHT AND HEAT CO., WHEELING, W. VA.

This bar and facing arm was used to rebore and reface 23" x 48" power cylinder for gas engine. Bar can be used also for relining cylinders.

Note facing arm attached to head. This arm was used to face the ends of cylinder, which had been welded and which was badly warped, when returned to us after welding.

After relining and facing cylinder, other fits (pads on combustion chambers, cylinder feet and water jacket rings) were

Wrinkle No. 95

checked with boring bar still in position and after squaring up these parts, cylinder was put in service on December 15th, 1919, and has been giving satisfactory results to date.

After machining this welded cylinder with the aid of apparatus shown, cylinder was put in A. No. 1 condition.

WRINKLE NO. 96

A PREVENTATIVE FOR WELLS SALTING UP

JOHN DENSLINGER, UNITED NATURAL GAS CO., SHIPPENSVILLE, PA.

I have experienced considerable trouble with some wells becoming salted up, and the only preventative that I could find was by making use of crude oil.

I had one well especially that would salt itself entirely in. I used fresh water to cut the salt, and after I had succeeded in getting the well perfectly clean, I run in about ten gallons of crude oil, and I have never been bothered with salt in this well since, as the salt will not adhere to an oily surface.

WRINKLE NO. 97

METER BOOK AND CARD HOLDER FOR BILLING

J. W. HUNTER, THE MANUFACTURERS LIGHT & HEAT CO., ROCHESTER, PA.

Insert book at binding between wooden jaws, tighten thumb screws until book is securely held. Book will then open flat and pages turned will lay flat without weight.

Fastened to bottom of board is steel spring which holds a packet of billing cards firmly in place on desk, keeping them in constant position with minimum trouble for removing each card as entry is made thereon.

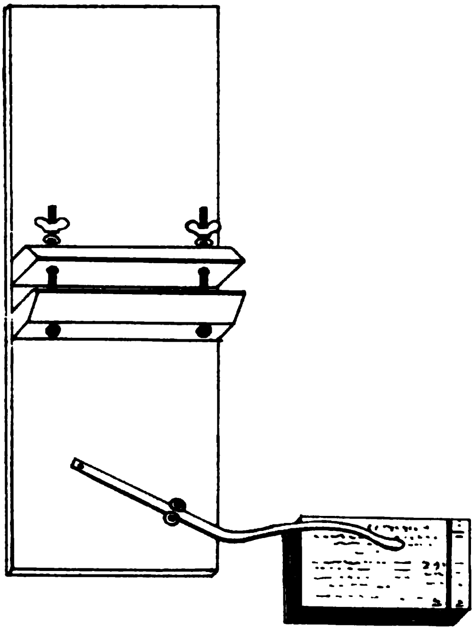
Size of holder, 15″ x 5½″.

Size of route book, 4¼″ x 7¾″.

Made of ¼″ Oak.

Wooden jaws 1″ thick, same material.

For convenience in holding meter reading book and cards while billing.



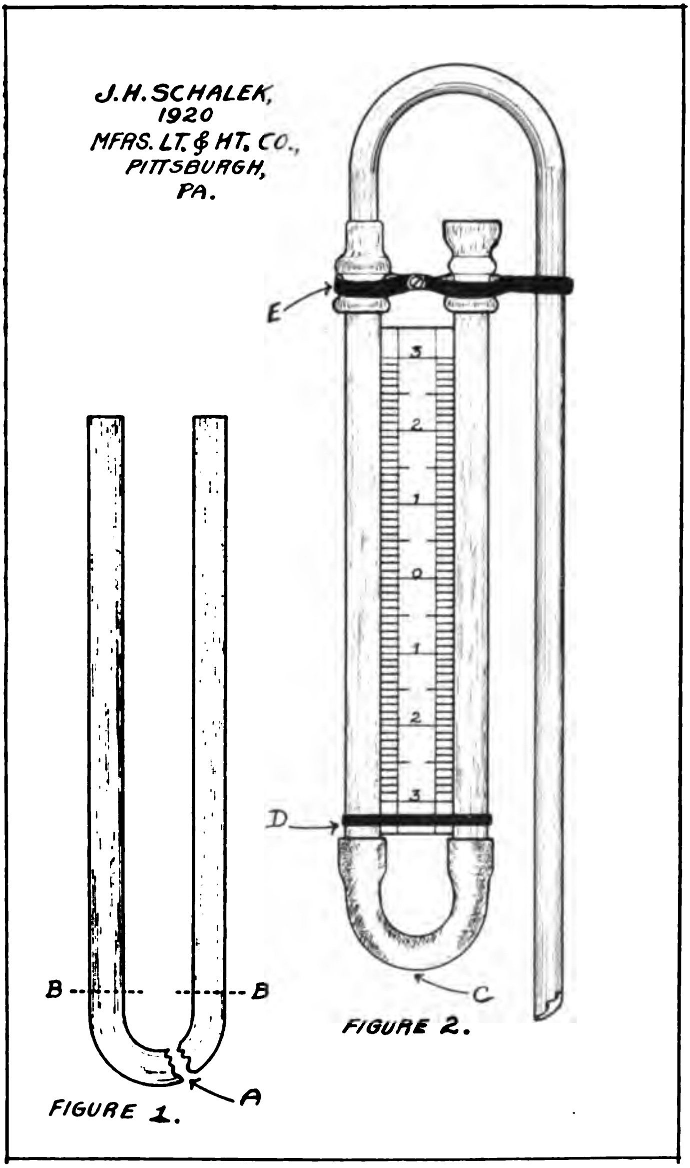
Wrinkle No. 97

WRINKLE NO. 98

REPAIRING SIPHON "U" GAUGES

J. H. Schalek, Manufacturers Light & Heat Co., Pittsburgh, Pa.

Very few gas men have inherited or otherwise acquired the art of glass blowing and therefore it is unreasonable to expect them to manipulate glass tubing with the skill that is necessary to produce the artistically perfect bend that is so much admired in a "U" tube. Many "U" tubes break at the bend (shown as 'A' in sketch) Scratch a line completely around both tubes with a three-cornered file. See 'B-B' in sketch. Hold filed tube tightly between thumbs and forefingers, thumb tips touching each other and thumb tips resting on filed line. Bend



Wrinkle No. 98

tube in direction of thumbs. The tube will break cleanly at the filed line. The same operation is applied to the other tube. Two straight tubes of equal length are now in your possession. A short piece of quarter-inch chemical rubber tubing or acetylene auto lamp tubing is placed on one end of each tube. See figure No. 2 in sketch. The other ends are cemented into the connections in the usual manner, as shown at 'E'. A rubber band 'D' is placed at the other end which will hold the tubes securely to the scale. If all this is done as directed the gauge will be as rigid as the original gauge. For permanency and utility, this repair job will run neck and neck with the real thing. Last, but not least, this gauge is more easily cleaned than the solid type. This is worth considering. Try it and learn the meaning of that familiar saying: "Save the pieces!"

WRINKLE NO. 99

TO PROTECT PIPE AND CASING FROM SULPHUR WATER

G. L. Williams, United Natural Gas Co., Shippensville, Pa.

In the Fryburg district, we have encountered some very bad water which causes pipe and casing to rust out.

In cases where sulphur water flows against and eats a hole in the casing, by measuring the casing to the point where the water strikes it, we know the point of entry of the sulphur water.

When the well is recased we administer a couple of coats of white lead and oil on the casing to the point where it was pitted or eaten out, and then wrap the joint that comes in contact with the sulphur water, with galvanized iron and paint over this wrapped section. By doing this, I believe the casing will last from five to eight years longer than it would otherwise.

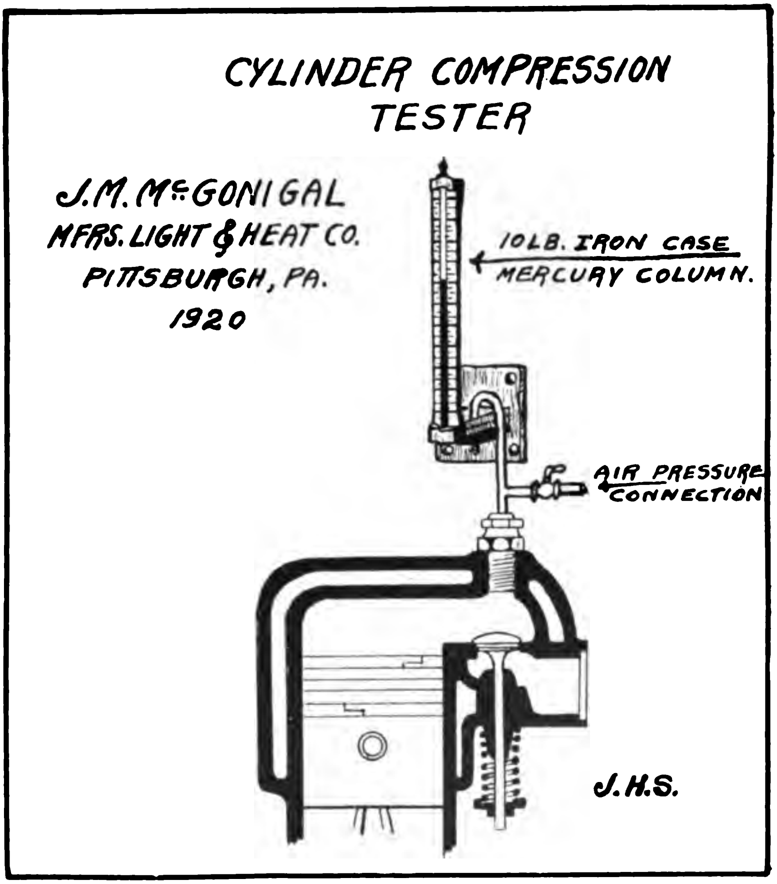
Where a gas line runs through a swamp, we have had very good success in preventing the line from becoming pitted or rusted, by wiring it to iron stakes.

WRINKLE NO. 100

AUTOMOBILE CYLINDER COMPRESSION TESTER

J. M. McGonigal, Manufacturers Light & Heat Co., Pittsburgh, Pa.

The economical performance of an automobile engine depends more than on any other one thing upon the ability of the cylinder and valve to hold its compression. The leakage of gas past the piston or valve means a loss in power; a loss in



Wrinkle No. 100

power means that more gasoline must be used to do the same work; more gasoline means higher cost per gallon.

The tester as illustrated was therefore devised to locate the inefficient cylinder or valve. The testing apparatus is screwed in the spark plug hole. The pressure of the air in the combustion chamber will cause the mercury to rise. If piston and valve are air-tight the mercury will remain stationary. If the mercury column drops a leak is indicated. The tester is easily made from a ten-pound iron case mercury gauge, a three-eighth in return bend, and a six -inch long three-eighth nipple sweated to a broken spark plug.

A steam gauge may be substituted for the mercury column but at a cost of decreased sensitiveness.

WRINKLE NO. 101

TO PREVENT LINES FROM FREEZING

C. A. SCHWAB, UNITED NATURAL GAS CO., SHIPPENSVILLE, PA.

We have several wells that are located along creeks, or small brooks, where the line, after leaving the drip, runs thru the bed of the creek. We experienced considerable trouble by gas freezing, or the line freezing solidly just where it left the creek.

This trouble was entirely eliminated by removing the line and running it above the stream. This can be done by wiring the line to pipe stakes, or to trees.

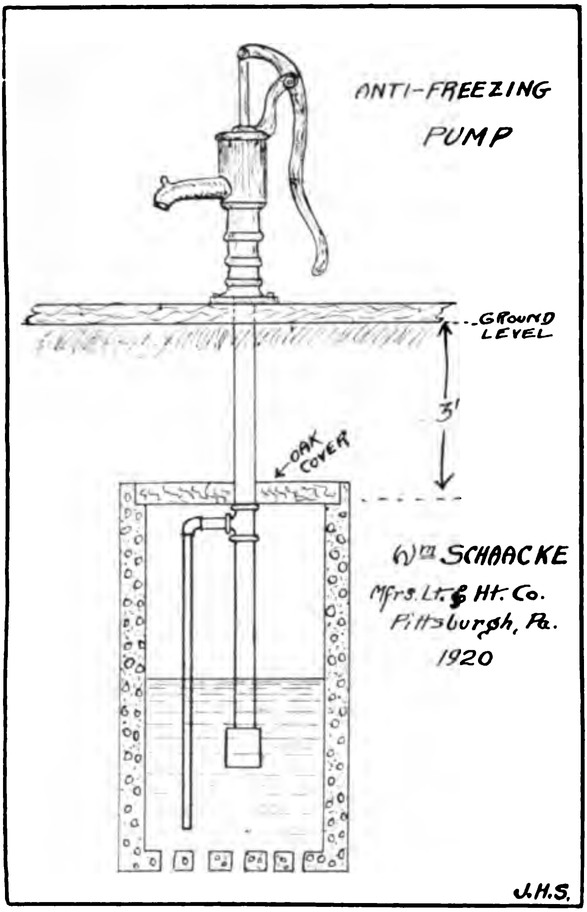
WRINKLE NO. 102

ANTI-FREEZING PUMP

WM. SCHAACKE, MFRS. LIGHT & HEAT CO., PITTSBURGH, PA.

Regulating and Pressure stations located in outlying districts where piped water is not to be had use the familiar farmers' cistern pump to supply the attendants with drinkable water.

Unless these pumps are of the regular manufactured anti-freeze type they will freeze. To overcome this trouble a quarter inch drain pipe is attached to the pump barrel and below the



Wrinkle No. 102

freezing line as shown in the sketch. The water will drain to the tee and still leave enough water in the barrel so that the question of priming need not receive a second thought. The water will not siphon out of the barrel of the pump because the air leakage through the top of the pump acts as a vacuum breaker.

WRINKLE NO. 103

A BLENDING CHART

R. P. ANDERSON, UNITED NATURAL GAS CO., OIL CITY, PA.

The chart pictured herewith is offered for use in blending different grades of naphtha with different grades of natural gas gasoline.

The directions for its use are given on the chart itself. It can be used equally well for determining the percentage of naphtha in a blend of given gravity, and for determining the gravity that will be obtained if a certain percentage of naphtha be employed.

To make actual use of the chart here shown, the Baume scale (BB) may be cut out and employed as directed, or it may be kept on the sheet as a standard scale, from which one for actual use may be made when needed. The writer carries chart and scale separately in his lefax note-book and the scale is made available for use merely by removing it from the rings.

WRINKLE NO. 104

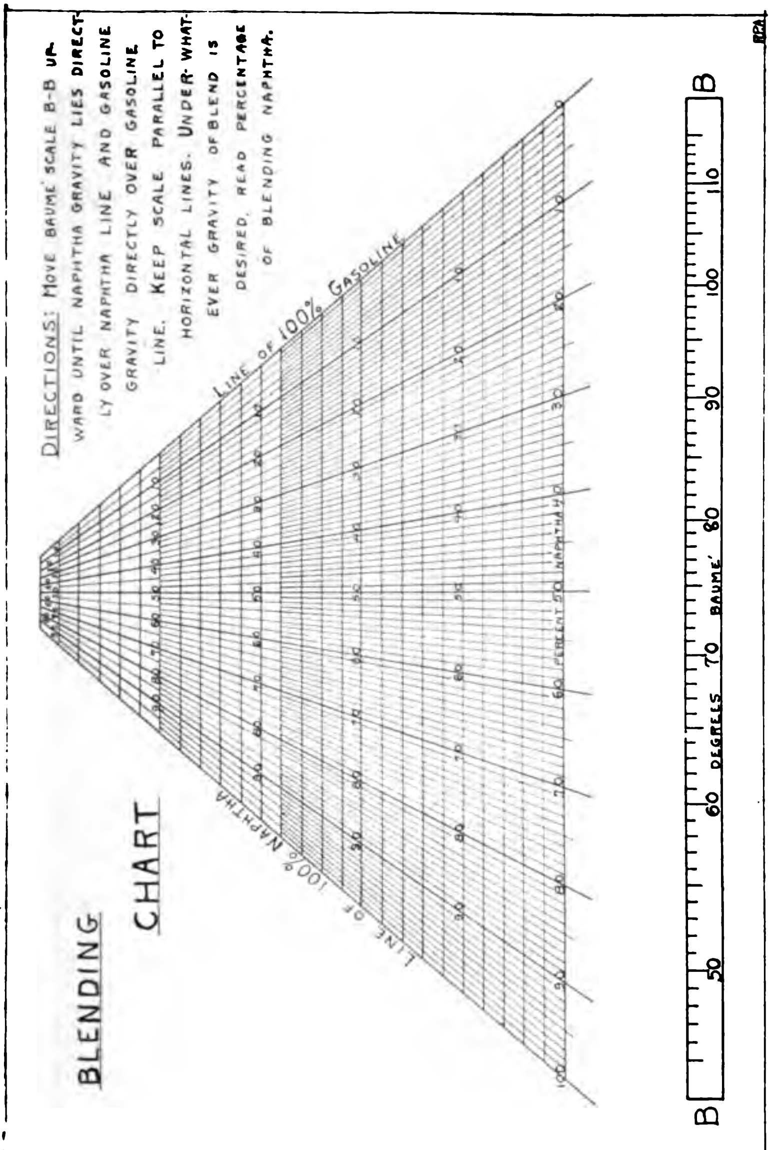
SAVING, BY DIRECTING PATRONS TO RIGHT DEPARTMENT

R. S. CHEATHAM, FORT WORTH GAS CO., FORT WORTH, TEXAS

After accounts become past due they are handled by our collection department who send out printed, filled in, notices giving the customer a certain length of time in which to pay up or have service discontinued.

Similar notices are used by the cashier in handling checks which have been returned to us from customer's bank on account of insufficient funds or other reasons.

We found that these people invariably 'phoned our bookkeeping department, who in turn had them switched over to the proper department. Now we have a pointer on these notices as follows: IF YOU TELEPHONE REGARDING THIS ACCOUNT, SPECIFY COLLECTION DEPARTMENT, with a slightly different wording for cashier's notices. This greatly reduces the 'phone calls coming in to our bookkeeping department.



Wrinkle No. 103

WRINKLE NO. 105

HAVE WRITTEN INSTRUCTIONS FOR NEW CLERKS

R. S. Cheatham, Fort Worth Gas Co., Fort Worth, Texas

Breaking in new clerks is quite a problem in an office employing a considerable number of people. The same questions come up time after time and have to be explained over and over again with each new clerk.

The work in the average gas office is divided into distinct elements comprising one kind of work for each clerk.

Supervision can be greatly reduced by compiling detailed written instructions covering each division of the work. These instructions can be improved by exhibiting ledger sheets, or other forms, on which work has been properly executed.

WRINKLE NO. 106

COMBINATION CURB BOX KEY

D. W. Brown, Mfrs. Light & Heat Co., Beaver Falls, Pa.

The drawing shows a combination curb box key for use on truck or wagon.

WRINKLE NO. 107

LOCATING HIDDEN CURB BOXES

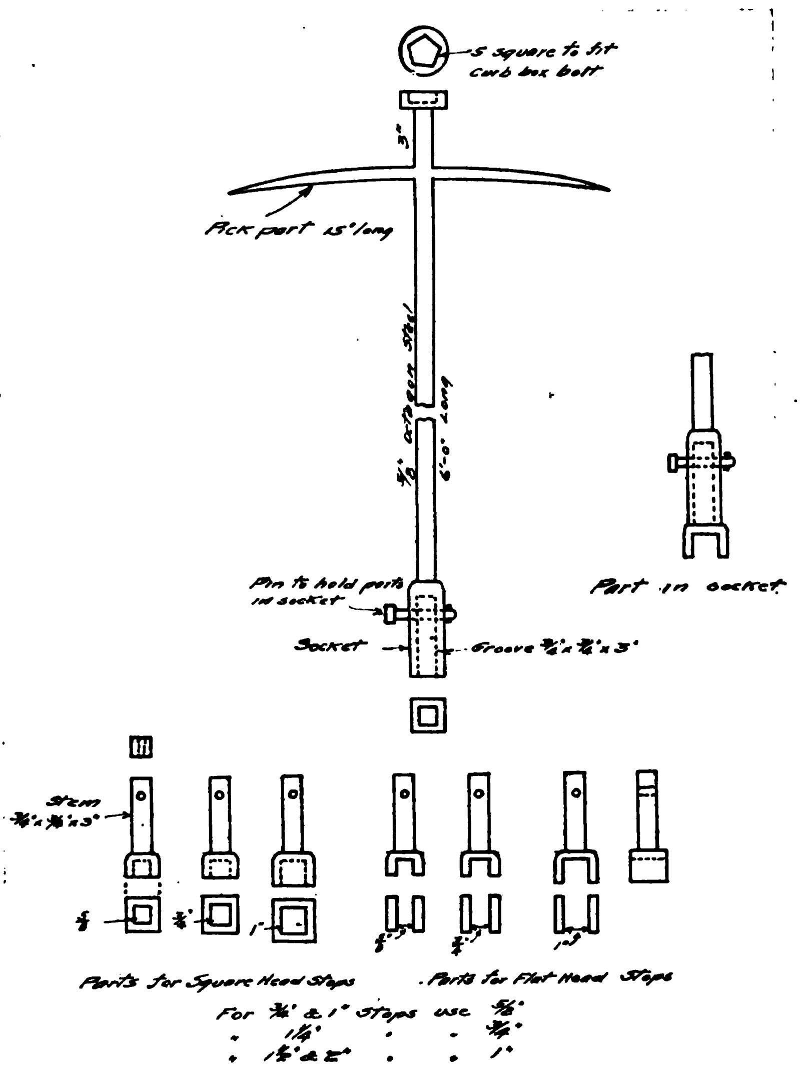
J. H. Schalek, Mfrs. Light and Heat Co., Pittsburgh, Pa.

"Curb box inspecton" isn't the soft job it's cracked up to be, and when one is assigned to it in the balmy February days then — well, there's an unprintable phrase in current use that fits this job.

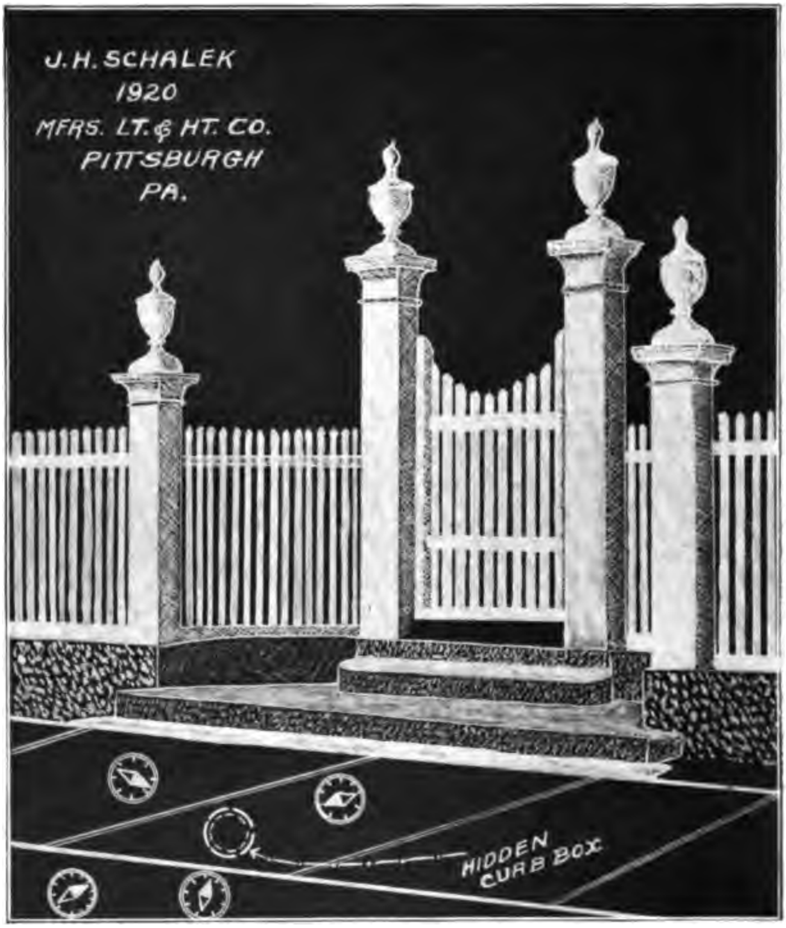
It is patent, of course, that in the inspection of curb boxes that one must first have the curb box. Our problem was to locate curb boxes covered by at least six inches of snow and ice.

Although this wrinkle, in effect, borders on the mysterious realms of spiritualism, no ouija boards or crystal gazers were consulted. An ordinary compass, an instrument used by boy

COMBINATION CURB KEY



Wrinkle No. 106



Wrinkle No. 107

scouts and daredevil rabbit hunters, costing fifty cents, is all that is necessary. Directions: First ascertain, if possible, the approximate location of the curb box, being guided by the service line entering the house. The approximate distance of the box from the curb line is indicated, in the majority of cases, by the boxes already found. Hold the compass steady, as close to the ground as possible, and when the compass nears the curb box the needle will be deflected. The nearer the compass is to the box the greater will the deflection be. Survey the ground at the point of the greatest deflection as shown in sketch.

I have personally found the exact location of over two hundred curb boxes by this method — not only curb boxes covered by a heavy layer of ice but also many that were buried nearly a foot under the ground. Other nimrods engaged in the pursuit of the elusive curb box and brethren of the fraternal order of "Street Key Toters" will find this method reliable, inexpensive, and worthy of a trial, either in summer or winter.

Later, experiments were conducted, making use of a Clinometer or Dipping Needle, and while it indicated the location of the curb boxes, it was found to be very much less sensitive than the compass and also had to be held at a certain angle with reference to the magnetic meridian. A curb box inspector can't bother with magnetic meridians, especially when the thermometer registers two and three quarter per cent below zero.

The fence and gate shown in the sketch have nothing to do with the wrinkle.

WRINKLE NO. 108

CONDENSED TABLE FOR COMPUTING FIRST PRODUCTION OF GAS WELL

WM. TAYLOR, MFRS. LIGHT & HEAT CO., PITTSBURGH, PA.

The condensed table shown is for computing the production of a gas well as shown by first minute raise in pressure.

Depth Ft.	*Pipe In.*			*Cubic Feet per 24 hrs.*
100	1	Per lb.	1st Min.	54
100	2	"	"	214
100	3	"	"	481
100	3½	"	"	564
100	4	"	"	856
100	4½	"	"	965
100	4⅞	"	"	1270
100	5	"	"	1337
100	5 3/16	"	"	1437
100	5⅝	"	"	1691
100	6	"	"	1923
100	6¼	"	"	2088
100	6⅝	"	"	2346
100	8	"	"	3420
100	8¼	"	"	3636
100	10	"	"	5343

Formula
(C D)
(A)

C — Cubical Contents
A — Atmosphere (14.70)
D — Delivery per Lb. per Minute

Wrinkle No. 108

It frequently is necessary to determine the approximate output of gas wells when connected into line, and as it is always desirable to eliminate open flow test of capacity, on account of the waste of gas, the foregoing table has been calculated to short cut all of the intervening computations necessary in order to determine the output.

The capacities herein shown are accurate and the table has proved to be a material factor as a time saver, after months of practical application.

WRINKLE NO. 109

DRIP USING "Y" AND TWO GATES MAY BE USED WITHOUT EMPTYING LINE

M. J. CUMMINGS, MFRS. LIGHT & HEAT CO., CAMERON, W. VA.

Herewith is shown drawing illustrating a drip that is connected to line with a "Y" instead of a tee. As we are using this kind of drip on main lines, I find it a great improvement over the old style drip.

By using two gates, drip repairs can be made without emptying the line, thereby saving gas as well as time and labor. And by using bull nipple below the tee with ½-inch pipe extending through the blind flange union to within 3 inches of bottom of bull nipple water can be syphoned out of drip without any waste of gas.

This drip will be found very practical on main lines where there is considerable water, oil or gasoline.

WRINKLE NO. 110

DRIP FOR CATCHING FLUID FROM GAS WELLS

EMPLOYEES, THE MFRS. LIGHT & HEAT CO., HUNDRED, W. VA.

The drawing shows method of installing drip for catching fluid from gas wells.

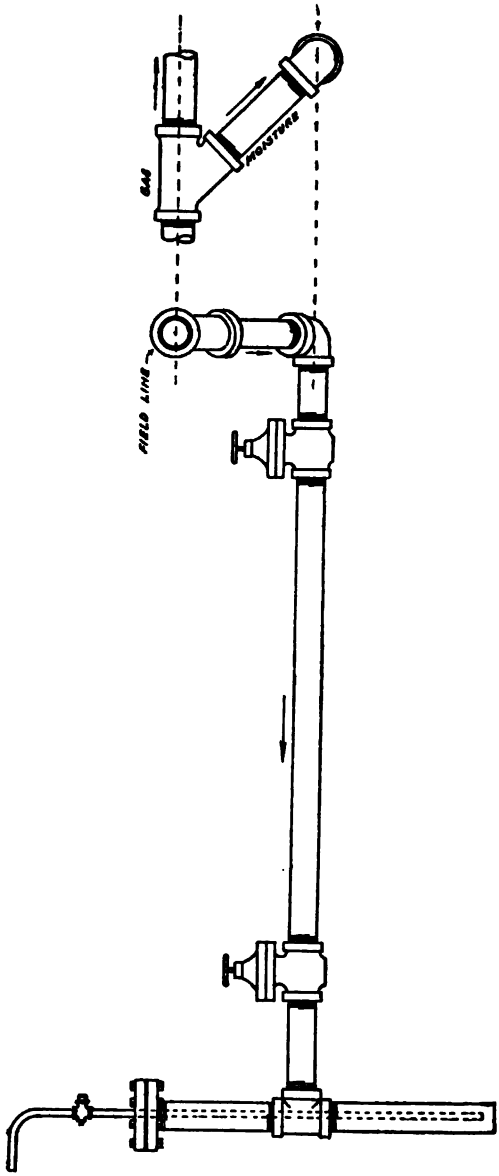
The sketch gives enough detail and is submitted by all the employees at Hundred, W. Va.

WRINKLE NO. 111

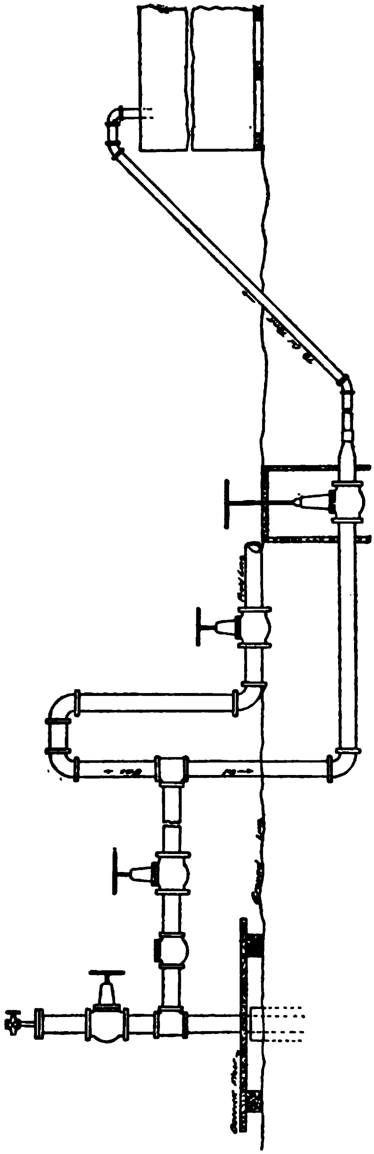
COMBINATION BELT AND TAPE MEASURE

RUSSELL W. HAHNE, MFRS. LIGHT & HEAT CO., PITTSBURGH, PA.

Those gas men who depend upon belts to uphold their dignity will appreciate this wrinkle. After this when the "gnawing pangs of hunger" demand that you go in quest of luxuries such as foodstuffs or pull 'er up another "notch", you will, instead, reduce the circumference an "inch" or two.

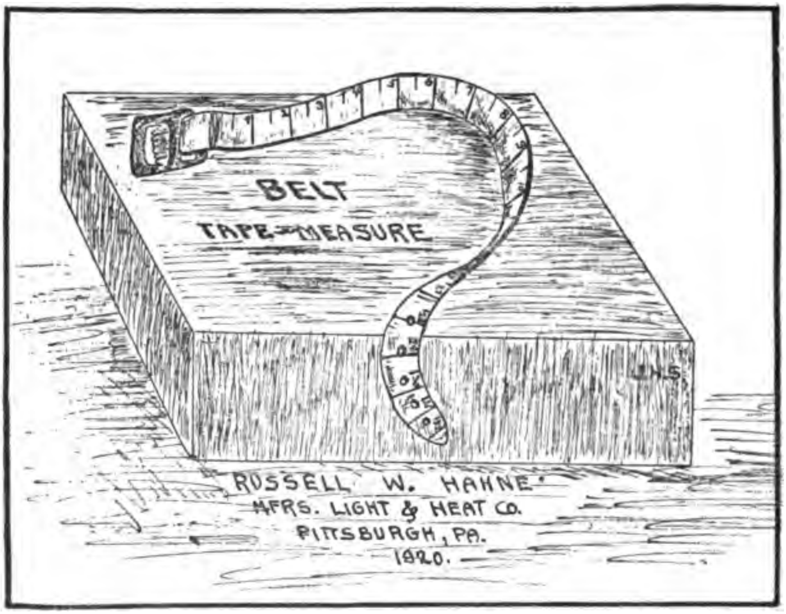


Wrinkle No. 109



Wrinkle No. 110

If your belt is marked in inches as the one illustrated you will always be in possession of a tape measure, that is, you will, unless you lose the trousers. The best way, and one in which the marks are ineradicable is by heating an old three-cornered file and burning the marks in the leather. Do not burn the marks in too deep or you may ruin the belt. All that is needed is a slight touch with the red hot file.



Wrinkle No. 111

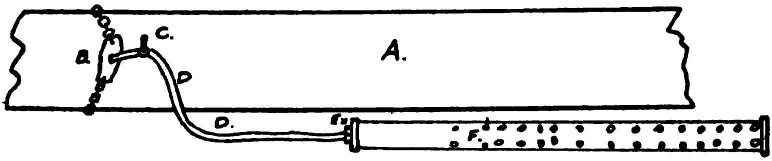
WRINKLE NO. 112

PORTABLE OUTFIT FOR THAWING FROZEN GAS MAINS

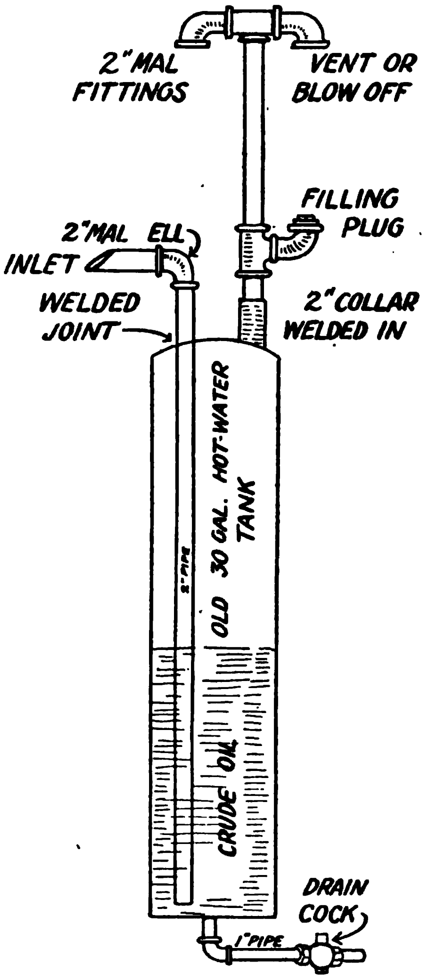
W. S. Kelly, Columbia Gas & Electric Co., Huntington, W. Va.

The drawing shows a portable outfit for thawing frozen gas mains.

This outfit has been tried by our company and is not only highly efficient but is economical from the point of fuel consumption and very speedy in obtaining results.



Wrinkle No. 112



Wrinkle No. 113

WRINKLE NO. 113

OIL SEAL SAFETY TANK MADE FROM USED HOT WATER TANK

F. D. WEIKOVSKI, THE UNION NATURAL GAS CO., CHATHAM, ONTARIO, CANADA.

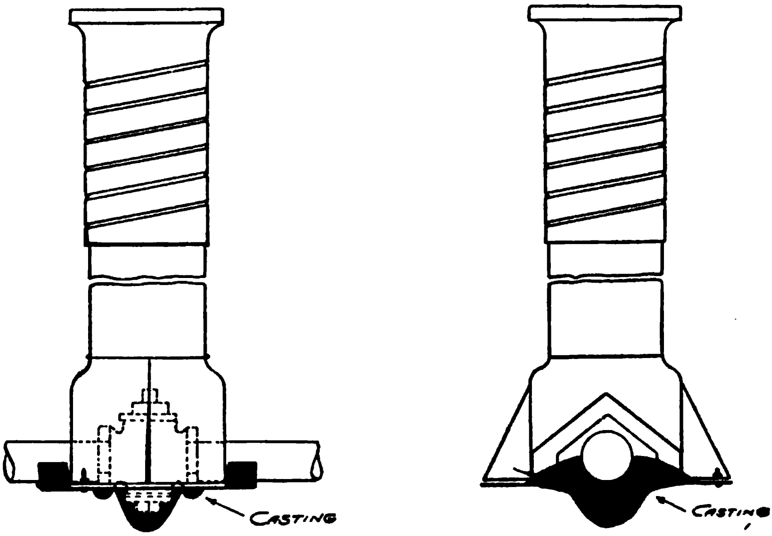
I am sending a wrinkle which we are using with great success, made up from 2" mal. fittings and a second-hand 30 gal. hot water tank. This costs but very little to make up and can be used up to 2" regulator. For 3", 4", 6" or 8" regulators the 60 or 80 gallon tank can be used.

These tanks can be picked up in most any city for about $1.00 each from the junk dealers.

WRINKLE NO. 114

ATTACHMENT FOR ANCHORING THE CURB BOX TO SERVICE STOP

M. J. YOUNG, THE EAST OHIO GAS CO., YOUNGSTOWN, OHIO



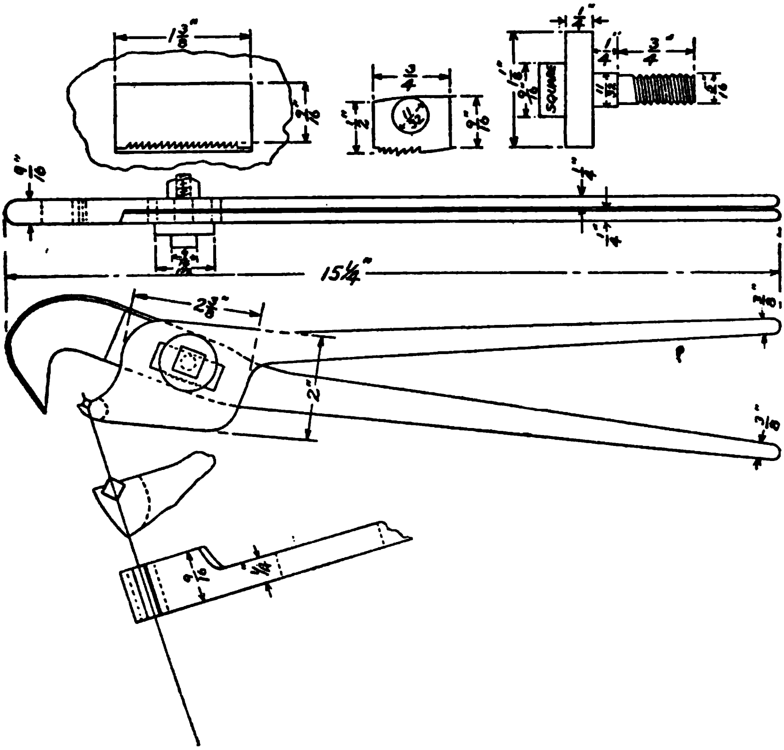
CURB BOX ATTACHMENT

Wrinkle No. 114

WRINKLE NO. 115

PIPE TONGS ADJUSTABLE TO SEVEN SIZES OF PIPE

JOHN A. ABRAMS, THE EAST OHIO GAS CO., CLEVELAND, OHIO



Wrinkle No. 115

WRINKLE NO. 116

IMPROVED BOLT FOR METERS

FRANK AVERILL, UNITED NATURAL GAS CO., BROOKVILLE, PA.

Present Style. Proposed Style.

Wrinkle No. 116

Most iron meters use a soft white metal washer under the head of the screw bolt which screws the back, front or side of meter to meter body, said bolt having a flat surface contact, which frequently squeezes the white metal washer outward preventing gas tight fastening. This bolt is shown on the drawing as "Present Style". The new "Wrinkle" or suggested screw bolt is shown with a recessed surface, which would have a tendency to draw the soft white metal washer inward towards the bolt insuring absolute gas tight joint.

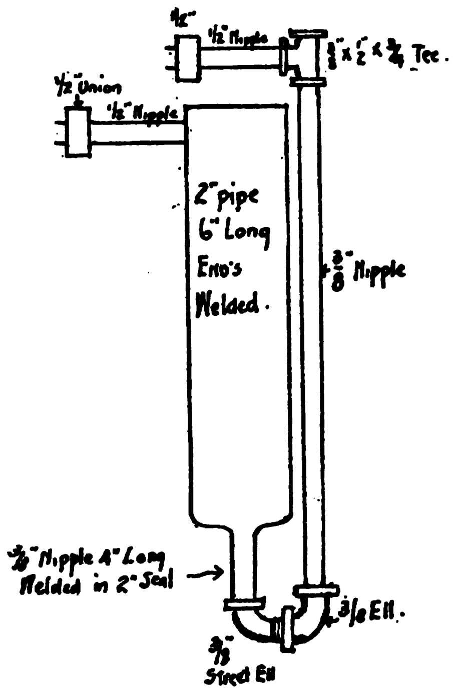
These bolts have been used by the United Natural Gas Company for some little time and have proven very desirable.

WRINKLE NO. 117

SIMPLIFIED WAY TO MAKE MERCURY SEAL

JOHN DEAN, COLUMBIA GAS & ELECTRIC CO., BRANCHLAND, W. VA.

The sketch submitted shows a simplified form of making the mercury seal for use on differential meters.



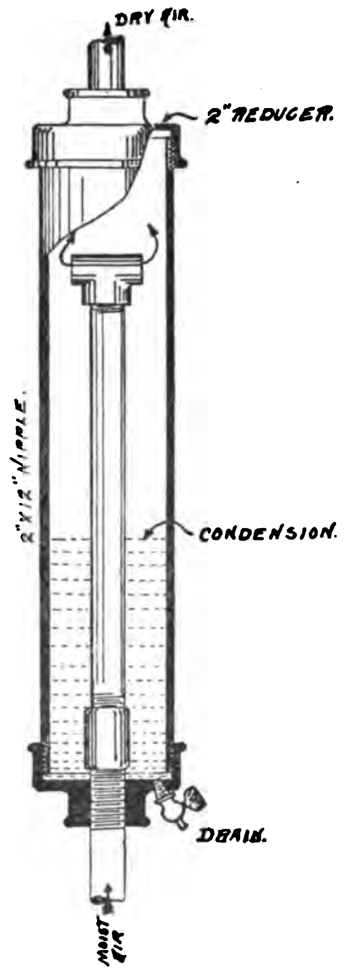
Wrinkle No. 117

WRINKLE NO. 118

MOISTURE SEPARATOR FOR GARAGE AND GAS ENGINE LINES

C. T. GUNTRUP, THE EAST OHIO GAS COMPANY, CLEVELAND, O.

Moist air has a tendency to deteriorate automobile tires and the enclosed sketch illustrates an effective method for dehydrating it. The apparatus must be installed in a vertical position.



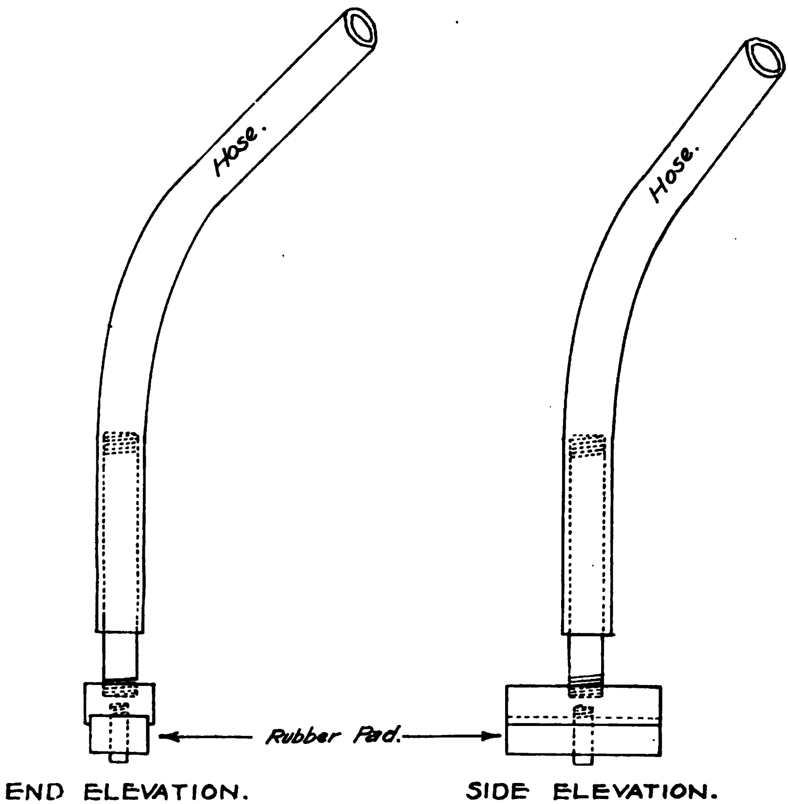
Wrinkle No. 118

WRINKLE NO. 119

TOOL FOR TESTING DIAPHRAGMS IN IRON CASE METERS

J. J. FLYNN, UNITED NATURAL GAS CO., OIL CITY, PA.

The cut shows a very simple and efficient appliance for testing diaphragms in Iron Case Meters. In making test, valve cover is removed, and the rubber pad of the testing tool placed over the port of valve seat that leads to the inside of diaphragm. Air or gas, under 3 inches water pressure, is then passed to inside of diaphragm, through rubber hose connected to arch gauge. If diaphragm has hole in same, or is porous, leakage



Wrinkle No. 119

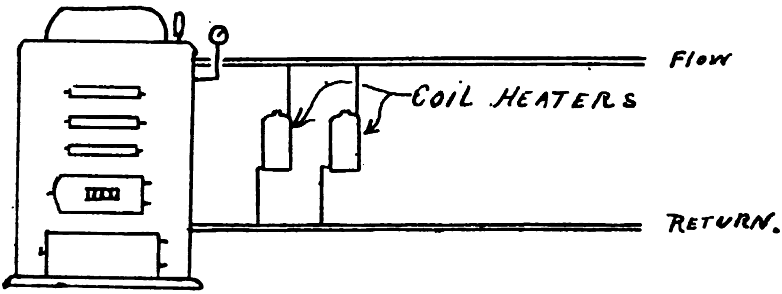
will show up on arch gauge and size of leak will be indicated by timer clock.

WRINKLE NO. 120

GAS AUXILIARY ON COAL HEATING BOILER

H. H. HARRINGTON, LORAIN, OHIO

The cut shows a method for attaching Gas Auxiliary on coal heating hot-water boiler. To be used during medium cool weather, instead of coal fire in boiler.



Wrinkle No. 120

WRINKLE NO. 121

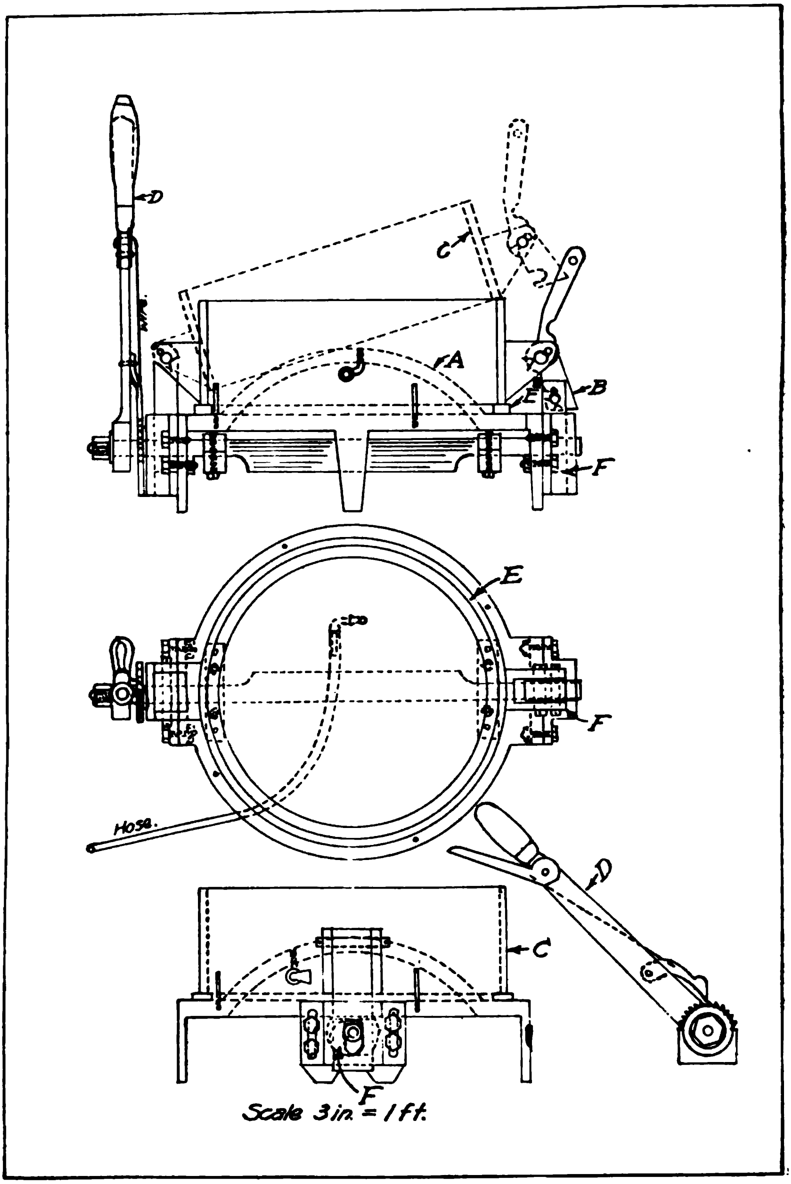
NO. 1 TOBEY DIAPHRAGM TESTING TOOL

F. C. HANCHETT, UNITED NATURAL GAS CO., TITUSVILLE, PA., AND JOHN McDONALD, UNITED NATURAL GAS CO., BRADFORD, PA.

A very efficient tool for rapid and open examination of either new or old No. 1 Tobey diaphragms is shown in drawing.

Diaphragm is laid over casting at "A", which is made to fit shape of inflated diaphragm. Collar "C" is then dropped into position and hooked at dog "B". Pull handle "D" and collar "C" is forced down on diaphragm resting on soft rubber ring "E" by eccentrics on shaft "F". Gas is then turned on through hose connection under diaphragm, inflating as desired.

Hundreds of diaphragms have been recovered and put into service through the use of this tool. It is becoming very difficult to secure diaphragm leather and this plan helps us to maintain our present supply.


D
C
A
E
B
F
E
F
Hose.
D
C
F
Scale 3 in. = 1 ft.

WRINKLE NO. 122

METHOD OF INSTALLING DRIPS ON LOW PRESSURE MAINS WHEN NECESSARY TO REMOVE WATER WITH FROST DEEP IN GROUND

J. B. Porterfield and C. D. Smith, United Natural Gas Co., Oil City, Pa.

The photograph shows two saddles with bolts used in place of "U" straps. In order to save digging under pipe to make tap, hole is drilled through both upper and lower saddles and through top and bottom of pipe. Top saddle is then plugged, and drip installed on bottom saddle.

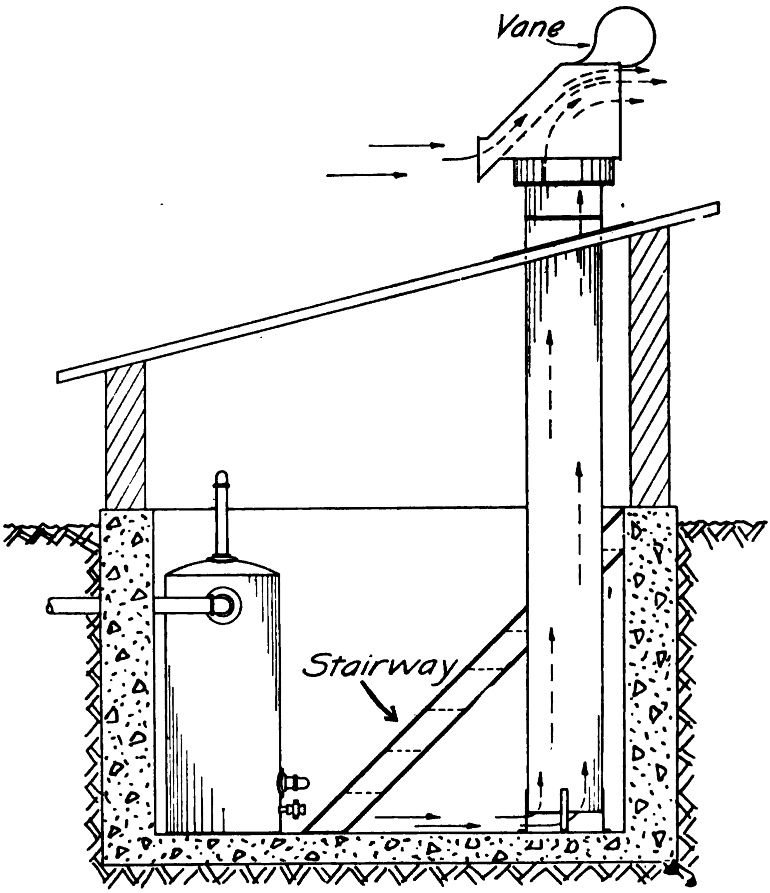
Wrinkle No. 122

WRINKLE NO. 123

VENTILATION TO CARRY OFF HEAVIER-THAN-AIR VAPORS —A SAFETY DEVICE

C. H. M. BURNHAM, THE OHIO FUEL SUPPLY CO., COLUMBUS, OHIO.

Not a few fires have occurred and lives have been lost resulting either from burns or asphyxiation due to improperly ventilated enclosures containing inflammable vapors. This is



Wrinkle No. 123

especially true when the type of construction of a building, or the characteristics of the vapors filling the same, preclude the possibility of properly ventilating by opening windows and doors.

Such a case as this is represented in the accompanying sketch showing a drip or accummulator tank pit, such as is commonly found about many of the natural gas compressing stations and gasoline plants. Any gasoline vapors coming into this building being heavier than air tend to fill and remain in the pit, making it an extremely dangerous place to work.

This condition has been remedied by the use of a suction ventilator arranged with a riser as shown. This ventilator is actuated by the wind, which being properly directed creates a suction in the ventilator, and draws up the gasoline vapors, as indicated by the arrows, from near the floor, which in turn are replaced by fresh air from above. Since a very slight breeze is sufficient to cause a draft, the possibility of the ventilator failing to operate is remote.

To handle undesirable vapors lighter than air, such as natural gas or hot air, the same type of ventilator will remove them if installed in the roof of the building without the riser from the floor.

WRINKLE NO. 124

DEVICE TO SAVE CONNECTING AND DISCONNECTING REGULATORS WHEN TESTING

JOHN McDONALD, UNITED NATURAL GAS CO., BRADFORD, PA.

This device is to save connecting and disconnecting regulators when testing out same in shop. It consists of two plates 14″ in diameter and 1½″ thick mounted on two ¾″ x 32″ rods, with four extra rods ¾″ x 21″ with about 11″ of thread for compressing. The plates are tapped at the center with ½″ threads; the tap at inlet to receive compressed air, the tap at outlet leading to pressure gauge and a check opening. The equalizer pipe is connected to the outlet line. The rubber used for packing is ¼″ x 11″ and is attached to [illegible] inlet and outlet nipples by use of washers and locknut. The whole is mounted on a 1½″ pipe frame with casters for convenience.

Wrinkle No. 124

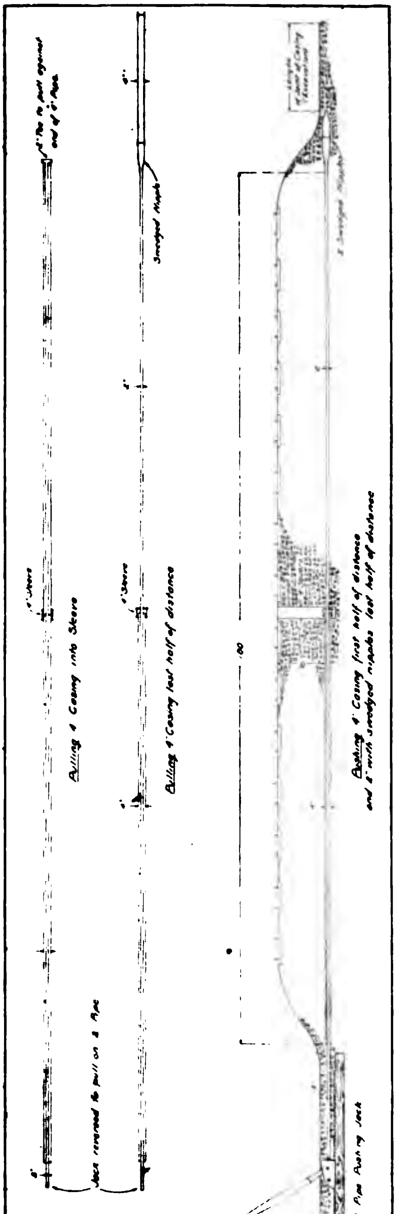
The $1\frac{1}{4}''$ nipple supporting regulator bowl is threaded through a floor plate by which bowl can be raised or lowered. The base board is attached to mount by pipe straps movable on same. This arrangement will accommodate regulator bowls from $2''$ to $6''$ inclusive.

WRINKLE NO. 125

METHOD USED TO PUSH A STRING OF 4-INCH CASING UNDER FIFTEEN RAILROAD TRACKS, A DISTANCE OF 180 FEET

J. D. Rennick, Logan Natural Gas Co., Columbus, Ohio

First, dig a trench, approaching tracks, long enough for the longest piece of casing and pipe jack, and the depth you wish



Wrinkle No. 125

to be laid under road bed. Level trench and set jack in position far enough back to permit the longest piece of casing to lay in trench. Level casing and be sure that first joint of casing enters straight and level. As casing is pushed in, keep adding joints until you get to the limit of strength of jack and man power, which in our case we found to be about 90 feet of 4" casing. (See the drawing.)

Second, keep a correct measurement of each joint of casing as it is pushed in and you will be able to locate the end, at which point, dig a pit about four feet square down to the end of the casing.

Third, run enough 2" pipe through the casing until the end comes into the pit and then screw on the 2" pipe, two 4" x 2" swag nipples to be used in making a 4" hole from the pit to the other side of the road bed. Dig a trench long enough to lay a joint of 4" casing, in line and on the level with the two pipe you have pushed through. Remove one 4" x 2" swage nipple and screw a joint casing to the other 4" x 2" swage nipple. Reverse your jack, fasten a chain to your 2" pipe and pull 4" casing through to the pit, adding joints of casing as it is pulled through.

Fourth, remove 4" x 2" swage nipple and place sleeve on 4" casing where you have taken off swage nipple. Push the 2" pipe through the casing and screw tee or other large fitting on the end of pipe so that it will catch the end of the casing and enable you to pull the casing through far enough to sleeve up the ends in the pit.

Fifth, this was done at the T. & O. C. Shops at Bucyrus, Ohio, in hard clay ground, and at a depth of 8 feet under tracks. It would have required a great amount of labor to dig and tunnel under so many tracks as almost every track was filled with cars.

WRINKLE NO. 126

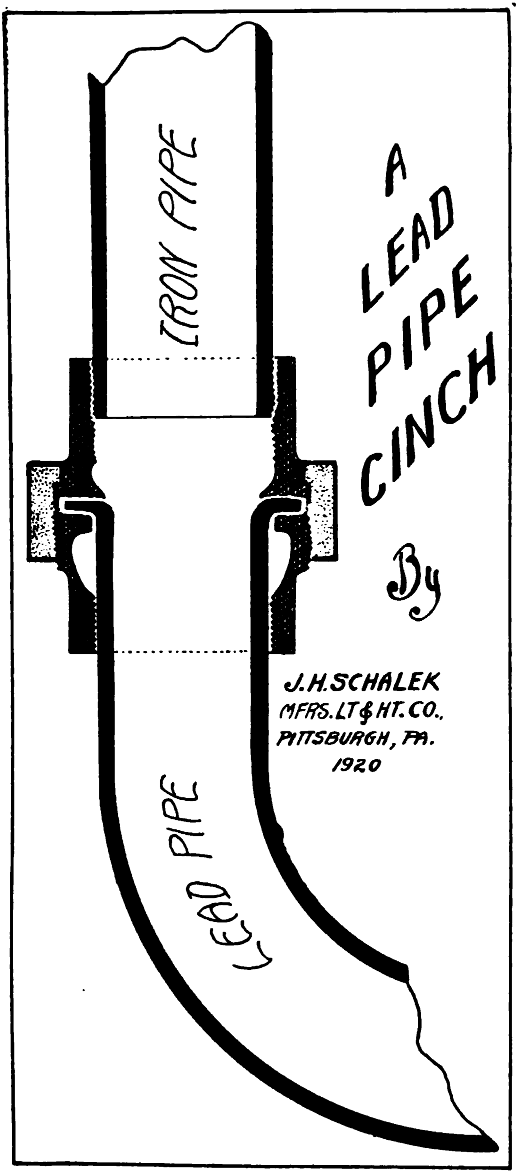
A LEAD PIPE CINCH — WHY WIPE A JOINT?

J. H. SCHALEK, MANUFACTURERS LIGHT & HEAT CO., PITTSBURGH, PA.

Remember how, when you were younger, you watched the plumber wipe a joint and you didn't understand why a plumber had the nerve to request monetary remuneration for such a cinch as wiping joints? Remember? And — when the time came when it was necessary for you to repair a break in the water pipe how you made desperate efforts to invent new swear words to ease your rage, when the solder refused to stick? And — when, after three more hours — surrounded by words foreign to Sunday Schools — you finally got it to stick, it suddenly melted a two-by-four hole in the pipe? Do you still remember? Simple as it appears to the onlooker joint wiping demands a high degree of manipulative skill which is acquired only after much practice.

Gas men who have the occasional job in which two lead pipes must be connected or where a lead and iron pipe must be joined may forget their past grim struggles with wiped joints if they will be guided by the accompanying sketch. Best of all, no skill is required. The union should be just large enough to allow the lead pipe to slip in readily. The tongue of the half-union is filed or ground off. The pipe is then inserted and peined or hammered over the seat of the half-union. The same operation is performed with the other part of the union and pipe. The hammered pipe ends are brought together and coupled together by the union ring. No gasket is needed as the lead acts as one. A union connected pipe has been in service in my home for over a year and holding tightly against a pressure of over ninety pounds per square inch without developing a leak. The sketch shows how an iron and lead pipe may be joined by this method.

This wrinkle is not only useful to those companies that connect up their Westinghouse meters with lead pipe, but can be also used for high pressure water connections.



Wrinkle No. 126

WRINKLE NO. 127

PORTABLE AND FOLDING GRADE INDICATOR

J. H. SCHALEK, MFRS. LIGHT & HEAT CO., PITTSBURGH, PA.

This wrinkle is a portable, folding grade indicator — an appliance that will prove very useful in determining the grade of pipe or in digging trenches where certain grades are specified; or, where extensions to lines are made, to keep the trench at same grade as service line or main.

It is easily made and is very cheap, since it is constructed almost wholly of 1¼" x ⅛" band iron. The indicator, when folded, weighs very little and is about five feet long, one and one-fourth inches wide and about three-fourths inches thick. Set up for use (in 5 minutes) it stands about three feet high.

If constructed as shown in sketch it will indicate any standard angle that may be specified. It is just as compact and as easily folded as an umbrella. To fold: "A" is fastened to "A", "B" to "B". and "C" to "C". This is a "knock-about" apparatus that will stand the rough usage encountered in main laying and still maintain its remarkable accuracy.

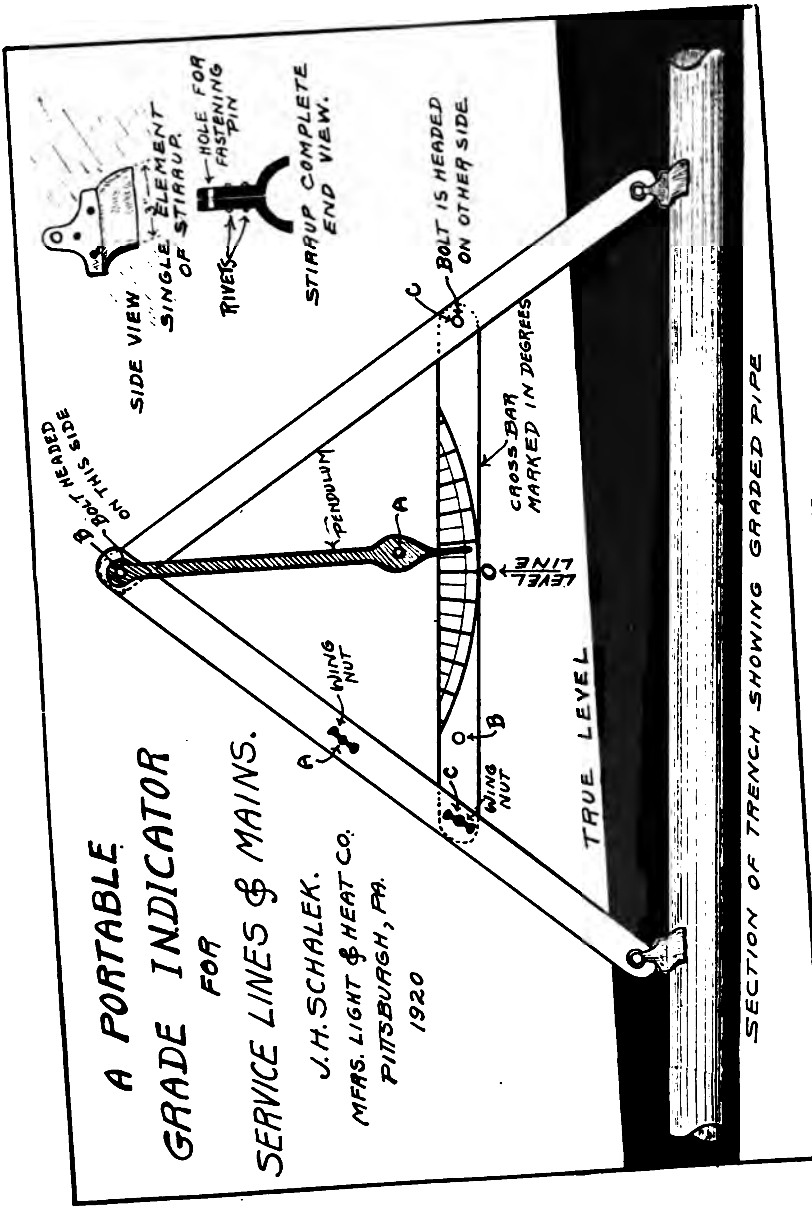
WRINKLE NO. 128

CUSTOMER'S DEPOSIT AND UNPAID BALANCE RECORD ON ONE CARD

R. S. CHEATHAM, FORT WORTH GAS CO., FORT WORTH, TEXAS

Many gas companies have considerable trouble carrying balances against customers who have discontinued service. This is particularly true of those using the Boston Ledger for their individual customers' accounts. The following method has been very satisfactory to us:

We maintain a card record of customers' deposits, which also serves as an alphabetical file. About once a month we go through the gas ledgers and locate all unpaid balances against customers who are no longer using gas. These balances are transferred to the customer's deposit card. In this way they are removed from the gas ledgers and it is impossible to refund the customer's deposit without collecting the unpaid balance as both records are on one card.



Wrinkle No. 127

WRINKLE NO. 129

METHOD FOR KEEPING LARGE LEDGERS SEPARATED

R. S. CHEATHAM, FORT WORTH GAS CO., FORT WORTH, TEXAS

Our business had grown from a small one to a comparatively large one in such a short time that the office had not kept pace with the growth. Sixteen large Boston Ledgers were piled in confusion all over the office and could not be found when needed.

By designating a certain desk for each ledger this trouble was overcome. Each desk has a large card over it showing the ledger number and anyone can go straight to this desk without going on a still hunt when they need a particular ledger.

To further improve this each clerk's desk is lettered, beginning with A and on up and the clerk is given a tag with a corresponding letter. When he carries a ledger to his desk he hangs his tag on the card over the ledger desk.

In this way we can always tell exactly where any ledger can be found and saves many useless steps and hours of time.

WRINKLE NO. 130

DEVICE FOR TAKING RECORD OF AMOUNT OF GAS PASSING FROM WELL TO LINE

IRA L. NEELY, THE MEDINA GAS AND FUEL CO., WOOSTER, O.

The device illustrated in photographs was out of stock parts after a sketch conveying the idea had been submitted to the regulator company.

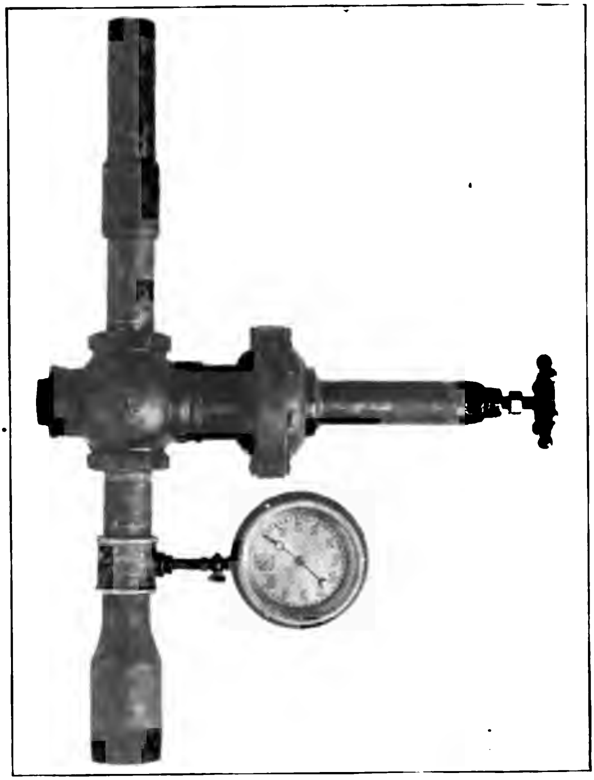
The regulator we are using is two-inch, and could be built in various sizes, and for various pressures, although we have found that two-inch size with a diaphragm and spring tension designed for pressures between twenty-five and one hundred pounds to be about right for our field in Ohio.

As you will note from the accompanying pictures the regulator when in use is attached to the blow-off valve of the well, the spring tension being adjusted for a higher pressure than the line pressure, the blow-off gate is opened and the line

Wrinkle No. 130

pressure noted by the gauge attached to the regulator, the line gate is closed and the spring tension on the diaphragm released until the regulator discharges the amount of gas into the air that had been feeding into the line, the diaphragm pressure being held constantly at line pressure.

The open or feeding flow is then taken by the ordinary pitot tube measurement and the gas immediately turned into the line, time for taking flow about five minutes, and as the well is not exhausted into the air the amount of gas lost is not more than



Wrinkle No. 130

five per cent. of the amount annually lost by taking the open flow.

A very close check of the amount of gas passing from the well into the line is obtained, and has been found to check very closely with the amount of gas passed by orifice and proportional meters in use at some of the wells.

The results obtained by taking the feeding flow of a field in this manner are dependable figures on the amount of gas available for use under actual field conditions. The open flow method results in an estimate being made that a possible one-third the open flow will be delivered into the line.

WRINKLE NO. 131

HOW TO MAKE GOOD QUICK CONNECTION BETWEEN CAST AND WROUGHT IRON PIPE

L. K. WHITEHEAD, SOUTHWESTERN GAS & ELECTRIC CO., TEXARKANA, TEXAS

Drawing illustrating the method used.

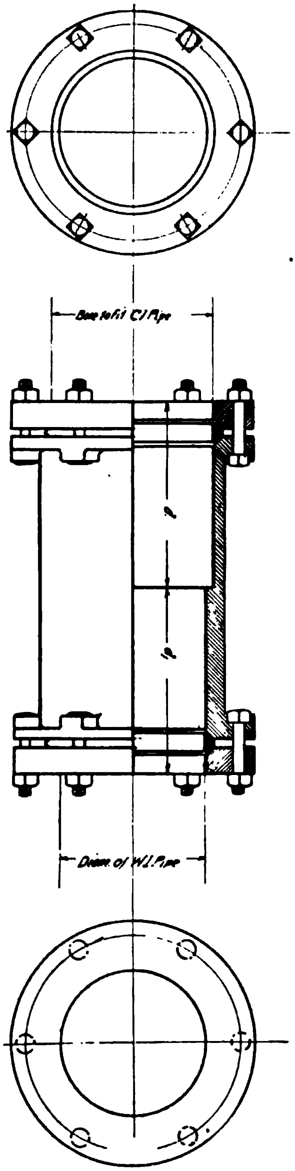
WRINKLE NO. 132

THE YOUNGEST GAS MAN IN THE WORLD—MORAL, TRAIN THEM YOUNG

J. H. SCHALEK, MFRS. LIGHT & HEAT CO., PITTSBURGH, PA.

The photograph will introduce to the members and friends of the Natural Gas Association the youngest meter-repairman and all-round gas man in America, if not in the world. There may be younger gas men, but, like the Scotchman, I hae ma doots. Gentlemen, meet Mr. Hahne. Russell W. is the handle. The "W" stands for WORK and Russell rhymes with HUSTLE.

Writing biographies is not the occupation of the writer and this poor and necessarily brief attempt will fail in doing justice to Russell. He is seventeen years old and was born in the wilds of Mt. Oliver, a borough near Pittsburgh. As the proverbial silver spoon was not at hand, he startled the world by appearing on its stage with a Stillson wrench. It is rather strange that the American historian, Henri Forde, neglected to record the event. Russell began his gas career by wielding pick and shovel and has since worked in almost all departments of this company. He is not a make-believe meter man but "the real stuff" and will rapidly develop into an expert. He was inoculated with "Pep" and "Zip" while still quite young, and—it "took". His sunny disposition



Wrinkle No. 131

and dry humor (no slur upon prohibition intended) appeals to al. who come in contact with him. The officials of this company believe in teaching the young idea to shoot—hence the reason for Russell's name on its payroll. There is no moral to point out but the Wrinkle is: "Get 'em and train 'em while they're young."

Wrinkle No. 132

WRINKLE NO. 133

USE DASH IN PLACE OF DITTO MARKS—LESS MISTAKES

C. C. Phillips, The Ohio Fuel Supply Co., Columbus, Ohio

In filling in pressures and doing other similar work, we use a dash instead of ditto marks to eliminate the frequent errors resulting from carelessly made ditto marks which have been mistaken for two ones, or eleven.

WRINKLE NO. 134

HOW TO SECURE CLEAR CARBON COPIES ON REPORT FORMS

C. C. Phillips, The Ohio Fuel Supply Co., Columbus, Ohio

Plainer carbon copies of all pencil made reports such as compressor reports, tube reports, etc., may be had by placing in the pad and under the last copy a thin piece of sheet metal the size of the pad or report.

WRINKLE NO. 135

TABLE FOR ACCURATE CALCULATION OF VOLUME OF GAS OR AIR HANDLED BY COMPRESSORS AT BOOSTER STATION

C. C. Phillips, The Ohio Fuel Supply Co., Columbus, Ohio

Formerly we averaged the pressures, etc., from reports for each day and received an approximate result. With this table we are able to arrive at a more accurate figure with a great deal less work. This idea was advanced by Mr. P. M. Biddison and has been in daily use by the writer for several years.

We formerly used the following formula for these calculations.

Cu. Ft. per Rev. per Min. X total Rev. per Min. X multiplier for reducing from inlet pressure to pressure base desired X Efficiency of Compressors in per cent X number of minutes.

Following out the above idea, we separated above into variables and constants, basing same on 60 minutes.

1. Variables — Intake pressure multiplier X Revolutions per minute. The table is made up to cover all intake pressures and rates of R. P. M. desired.

2. Constants — Cu. Ft. per Rev. per Min. X 60 X per cent efficiency. From above portion of formula constants are figured for each compressor and used as coefficients for compressor until efficiency or size of same becomes changed.

The table is used in the same way extension tables are used in Pitot Tube or Orifice Meter calculations, as is also the coefficient of the compressor. Hourly extensions are filled in and the coefficient applied to the total. After tables are figured, they may be used for any compressor, and in addition to saving a great deal of time, they give results of increased accuracy.

WRINKLE NO. 136

USE GAS ENGINE DRAIN WATER TO WASH WITH

CHARLES B. JOHNSON, UNITED NATURAL GAS CO., KANE, PA.

The drawing shows the construction of a device we have used at one of our Power Plants for several years.

This has proved so successful for washing clothes, waste and wiping cloths, that we are now building the second one.

This water wheel is operated by over-flow water from the circulating system from gas engines.

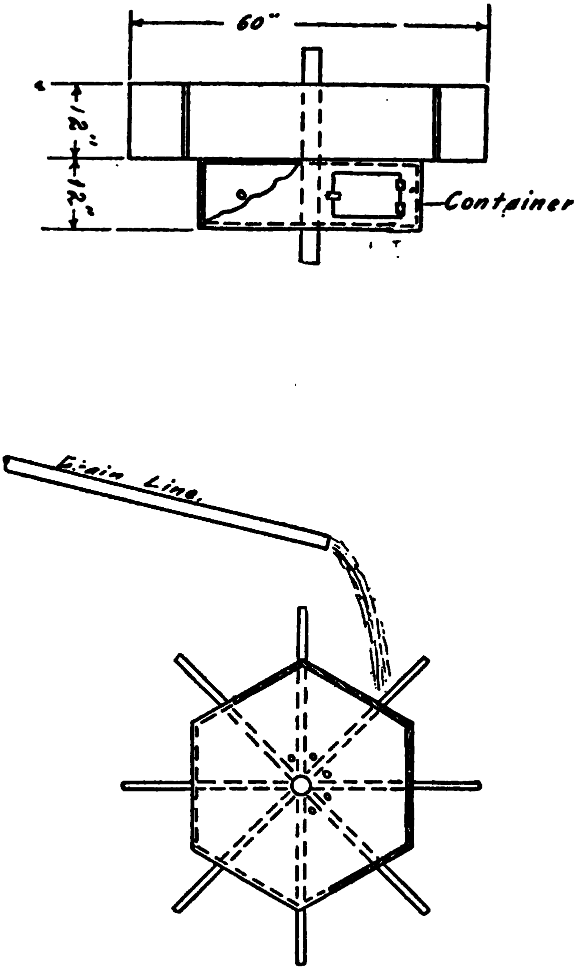
WRINKLE NO. 137

CARD SYSTEM THAT QUICKLY ADJUSTS METER TROUBLES

C. C. PHILLIPS, THE OHIO FUEL SUPPLY CO., COLUMBUS, OHIO

We have in times passed experienced much difficulty in noting and properly advising our meter department of meter troubles existing at various of our large measuring stations. Some months ago we devised a system of meter trouble reporting which has been very effective.

As the charts are received, they are inspected by a man trained to read meter trouble from charts. Cards, as shown in cut, are filled out by him, giving his version of the trouble. These cards are of post card design and where only one is to



Wrinkle No. 136

be mailed, may be sent by affixing stamp, and if more than one, they may be enclosed in an envelope. When all the charts have been inspected and the cards are ready for mailing, they are grouped into districts and forwarded to field inspectors. They, in turn, inspect the meter and report on the same card exactly what trouble was found and give all the information possible to assist in making an estimate for the period of inaccurate registration.

INSPECTION ORDER DATE 1/1 1920

AT Columbus 3-4 MEAS. STA. DATE 12/30 METER NO 41

Static clock stopped - Mercury blown

PLATE NEEDS CHANGING ☒ HAS 1/4 RUNNING 2" @ 700 LBS.

Diff gage probably high

REPORT Repaired clock, Connected differential
Found static OK - differential 10" high
Wells on same as previously
Have no smaller plate

ATTACH TO INSPECTION REPORT John Doe SIGN

Wrinkle No. 137

Only in exceptional cases is meter trouble in existence more than a week as this system of reporting is very rapid, giving field inspectors notations of all apparent troubles within one or two days after start of trouble. The cards are usually back in the office within the week, the trouble adjusted, estimates made, and forgotten, where formerly these meter adjustments would run for weeks.

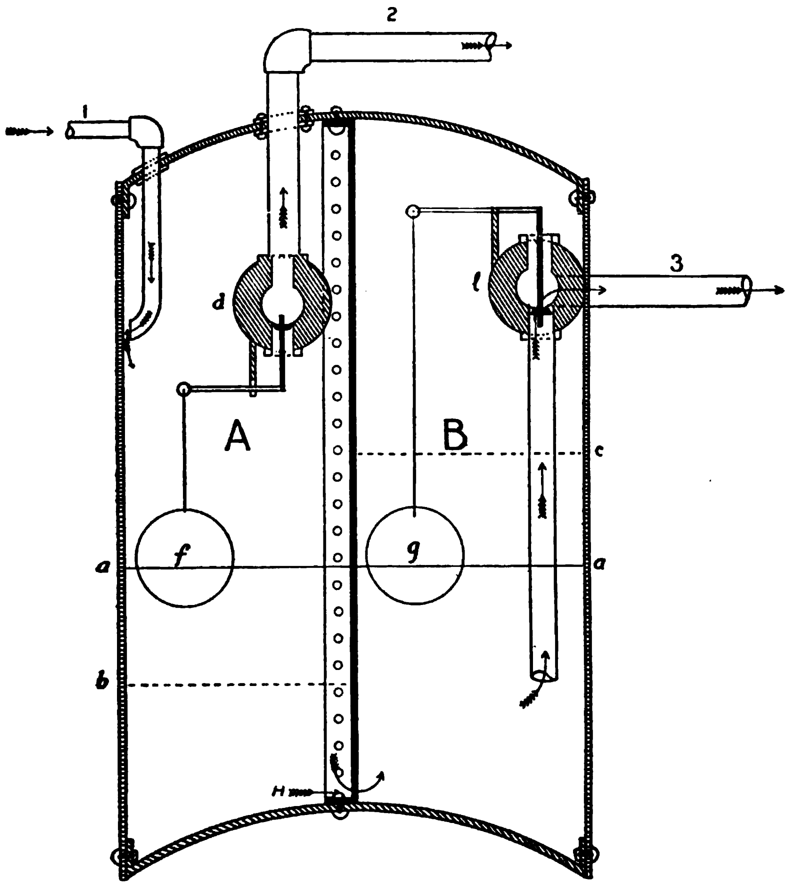
WRINKLE NO. 138

TRAP FOR SAVING GAS AT OIL WELL

R. O. WAGSTAFF, THE OHIO FUEL SUPPLY CO., SUGAR GROVE, O.

The rough sketch shows a trap for saving gas at an oil well. I believe it will convey my idea and its advantages over the ordinary trap.

No. 1 shows the inflow of oil and gas, No. 2 the outflow of gas, No. 3 the outflow of oil. (a) Shows the oil level at which the floats (f) and (g) are adjusted, (b) is the level at which



Wrinkle No. 138

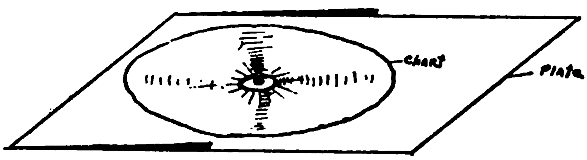
the oil can go with float (f) following, after the gas pressure has accummulated to the extent that the oil is forced down to (b) and raised to the level of (c), valve (d) will open and allow gas to flow out in line. Also valve (e) will open and allow oil to flow out in line 3, (h) is the opening at bottom of partition. The oil in both halves of the trap acts as a seal. If the pressure accumulates in "A" it will force valve open at (d) and will also force oil level down in "A", thus forcing the oil level up in "B", causing the oil to flow from No. 3, there being a slight pressure above the oil level in "B" caused by the rise in the level of the oil. The difficulty of most traps is to keep the seal. This trap will maintain its seal under all conditions, whereas other traps will not. A considerable quantity of gas is now being wasted, because of the inefficiency of the traps, and the casing-head gas is always rich in gasoline.

WRINKLE NO. 139

PLATE TO BE USED TO FIRMLY HOLD ORIFICE METER CHARTS

C. C. Phillips, The Ohio Fuel Supply Co., Columbus, Ohio

In filling orifice meter charts from extension books, it is necessary that the left part of the chart be placed under the



Wrinkle No. 139

book in order that the right side of the chart (the side being filled) will be close to the figures in the book. This work is more efficiently done when the chart is not held down too tight by the weight of the book. The chart, however, must be held sufficiently firm to withstand the writing, etc., and yet be easily turned by the writer.

We are experimenting with a plate as shown in drawing, which will hold the book in the proper position and allow for

firmness for writing and still enable the filler to turn the chart easily. We have not as yet perfected this plate but it gives promise of greatly improved results.

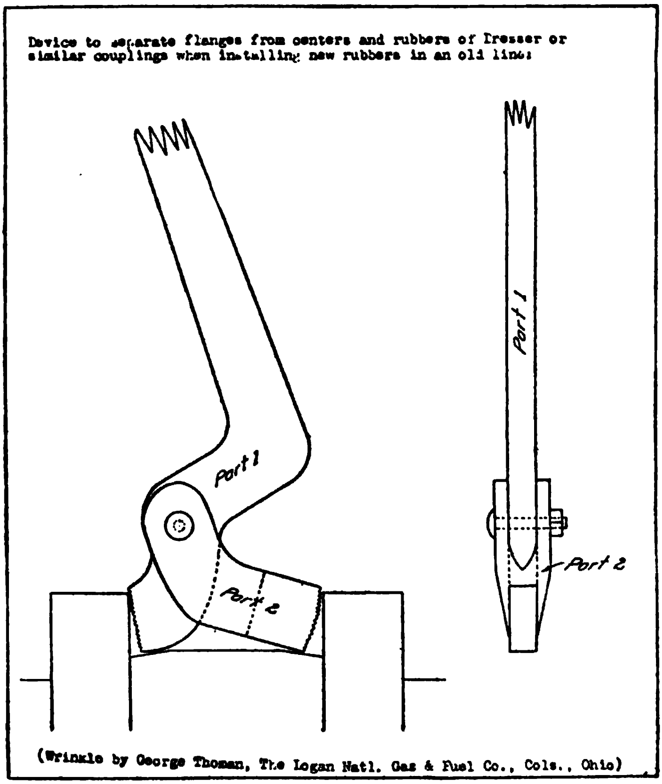
WRINKLE NO. 140

DEVICE TO SEPARATE FLANGES FROM CENTERS AND RUBBERS

GEORGE THOMAN, THE LOGAN NATURAL GAS CO., COLUMBUS, O.

The device illustrated is successfully used to separate flanges from centers and rubbers of Dresser, or similar couplings.

This device saves time when installing new rubbers in old lines.



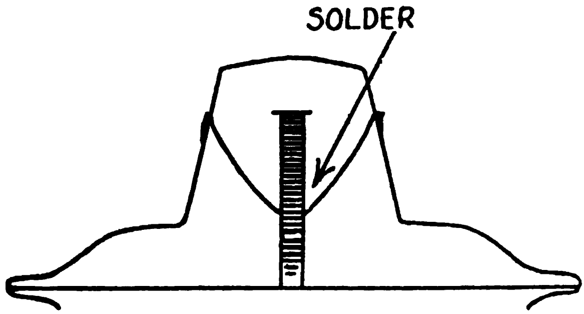
Wrinkle No. 140

WRINKLE NO. 141

HOW TO PREVENT CONSUMERS TAMPERING WITH HOUSE REGULATORS

L. G. May, Lone Star Gas Company, Bowie, Texas

To keep consumers from tampering with domestic house regulators, get the regulator at the pressure you wish to deliver,



Wrinkle No. 141

then mark the adjustment screw and remove, tin it with solder and dip into hot solder, seeing that all threads up to the mark are entirely filled with solder.

This will keep the consumer from screwing the set screw down and increasing the pressure, this causing considerable leakage at the vent and affecting the meter.

WRINKLE NO. 142

SPEED RULES FOR ADDING MACHINE

C. C. Phillips, The Ohio Fuel Supply Co., Columbus, Ohio

As in all machine operations there is a right and a wrong way of operation, so is this true of adding machine operation. The average operator will use many motions not necessary or helpful in the work. The correct way, and the one having the full approval of the fastest operators and demonstrators, is briefly as follows:

With one upward motion, and one only, depress all the keys needed in the number, *as passed,* using three fingers and not one.

With one downward motion, pull the handle. You should note the next number to be added while making the downward stroke. You are then ready to depress all keys on the up stroke again. For example, to place 19387 in the machine. Instead of the operator hitting keys in this order, 1-9-3-8-7, the keys should be depressed in this order, 1-3-7-8-9, but struck in the correct column by using the spread of the hand. Even the fastest operators can increase their speed at least 25% by the use of this method.

WRINKLE NO. 143

PLUG UP TEES ON OLD ARTIFICIAL GAS LINES

CHESTER L. MAY, LONE STAR GAS CO., MCKINNEY, TEXAS

In plants where natural gas is used in old artificial gas lines, it is often necessary to remove a large number of tees from service lines. This work can be expedited and done considerably cheaper by using solid plugs in the tees, if they are not already in, and sawing the plug off even with the bead on the tee.

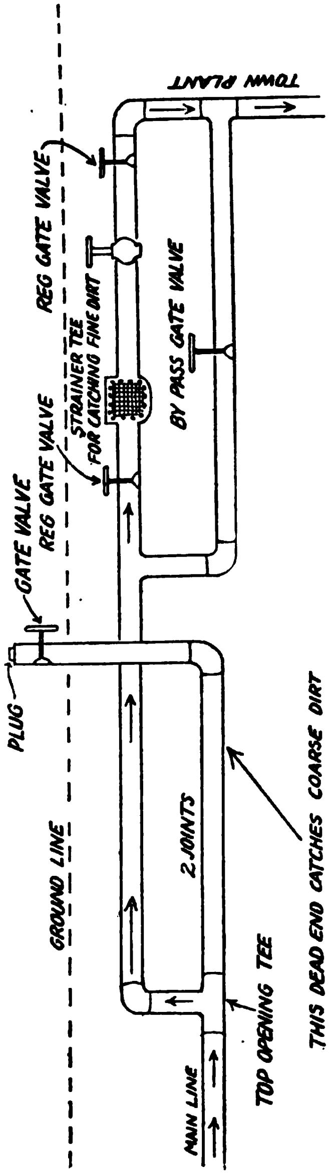
WRINKLE NO. 144

SYSTEM FOR CATCHING DIRT IN HIGH PRESSURE LINES TO PROTECT REGULATORS

CHESTER L. MAY, LONE STAR GAS CO., MCKINNEY, TEXAS

Quite often dirt, and even stones, will be carried along through the high pressure gas mains up to the gate valves and when these gates are opened to test the meters, this material is thrown into the high pressure regulator. This has been known to clog the regulator and in two instances we had to remove sticks from under the valves.

The method used to catch this dirt and other material in the dead end as shown in the drawing can be readily understood. This system of piping is a good plan for catching dirt in high pressure lines ahead of the regulator at the city limits.



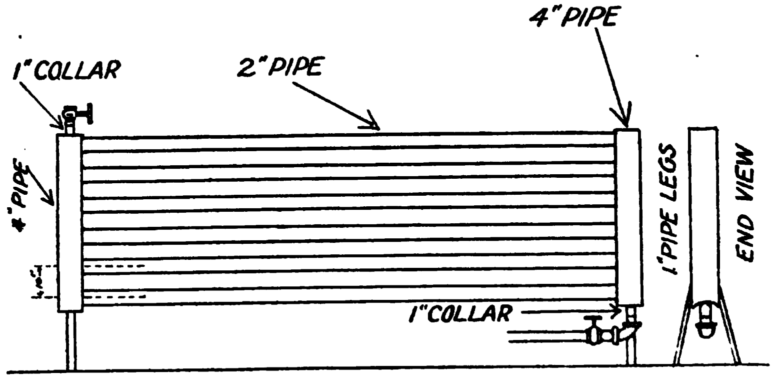
Wrinkle No. 144

WRINKLE NO. 145

STEAM RADIATORS MADE OF WELDED PIPE

J. J. DRISCOLL, THE NORTHWESTERN OHIO NATURAL GAS CO., SUGAR GROVE, OHIO

Radiators like the accompanying sketch are in use at our Wheeler Station, and are giving entire satisfaction. They can be made in any desired lengths and either horizontal or vertical as conditions require.



Wrinkle No. 145

All connections are welded except those to the inlet and outlet pipes. They can be made of pipe that cannot be threaded or of any grade of pipe that will stand the pressure required.

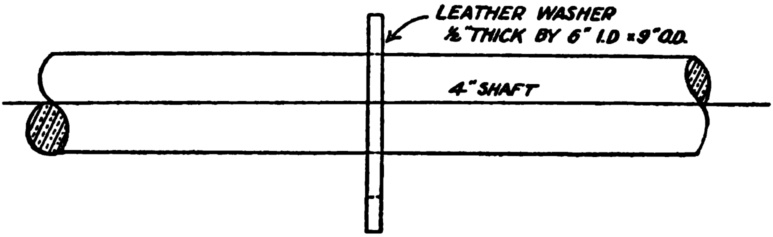
These heaters can be readily moved, as they are not attached to walls or racks.

WRINKLE NO. 146

DEVICE FOR POLISHING REVOLVING SHAFT

J. L. BOYD, UNITED NATURAL GAS COMPANY, STRONG, PA.

The drawing illustrates the method used for keeping shaft polished and clean.



Wrinkle No. 146

The washer is made of leather and one should be placed between each pulley or bearing. The washer should be from ½" to 2" larger, inside diameter, than the shaft.

This washer keeps constantly travelling as the shaft revolves, which keeps it polished and clean at all times.

WRINKLE NO. 147

GASOLINE WEATHERING TANK

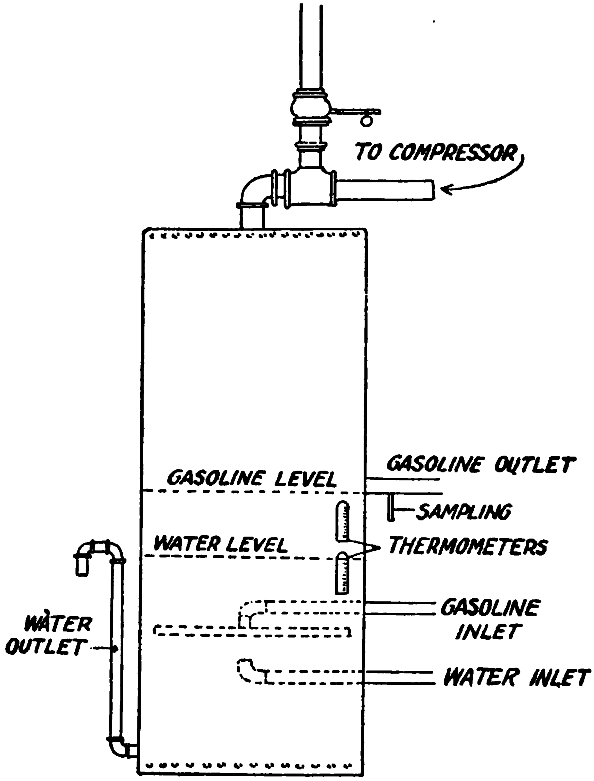
Henry Cooney, The Ohio Fuel Supply Co., Sugar Grove, Ohio.

The accompanying sketch shows a tank for weathering gasoline at, or near, atmospheric pressure. The dissolved gases and "wild" fractions being removed from the gasoline by washing with water, as indicated. The vapors released from the gasoline to pass thru an independent regulator, which should be sealed, to the compressor working on the "tail" vapors. For weathering gasoline held under pressure, or where it is desirable to establish a level for conducting the gasoline to storage by gravity, a length of pipe may be used as the tank.

The temperature to be maintained on the tank will depend on the conditions at the plant. The temperature of the atmosphere; "overpoint", gravity and vapor pressure desired in the finished product; nature and location of the storage, etc.—all should be given consideration.

A test recently made by washing the gasoline from the "Running Box" with the water separating from the gasoline at the "Running Box", shows that more than 2 cu. ft. of vapors can

be removed from each gallon of gasoline washed. The temperature of the gasoline and water, in this instance, being practically the same. Pressure on the "Look Box" 6 to 8 inches water. It is evident that this 2 cu. ft. of vapors would escape for each gal-



Wrinkle No. 147

lon of gasoline at Run Tank or storage, and in many plants be lost.

If this gasoline were weathered by washing with water 10° Fah. higher in temperature than the gasoline, or 60° Fah., it is believed, from tests made, that in all 6 cu. ft. of vapors could be recovered from each gallon of gasoline washed.

By returning the vapors to the compressor working on the tail vapors, as suggested, the increase in the yield of the plant, it is believed, will be equal to, if not greater than could be secured by handling the vapors with a separate compressor. Moreover should the Weathering Tank become too warm there would be but little chance for loss of gasoline for nothing can leave the "circuit" until rejected by the "high" compressor.

WRINKLE NO. 148

USE METER TO CHECK UP LOSS ON COUNTRY MAIN LINE TAPS—BY-PASS THE GATE

CHESTER L. MAY, LONE STAR GAS CO., MCKINNEY, TEXAS

In the larger plants it is usually the case that the outlying districts receive less attention than other parts. I believe it an excellent plan, where a tap is made off either intermediate or low pressure, to supply a suburb, to install a by-pass around the top gate and leave a meter space in it. In this manner all meter stops in the addition can be shut off and the line loss accurately determined by noting, for a short time, the registration shown by the tap meter.

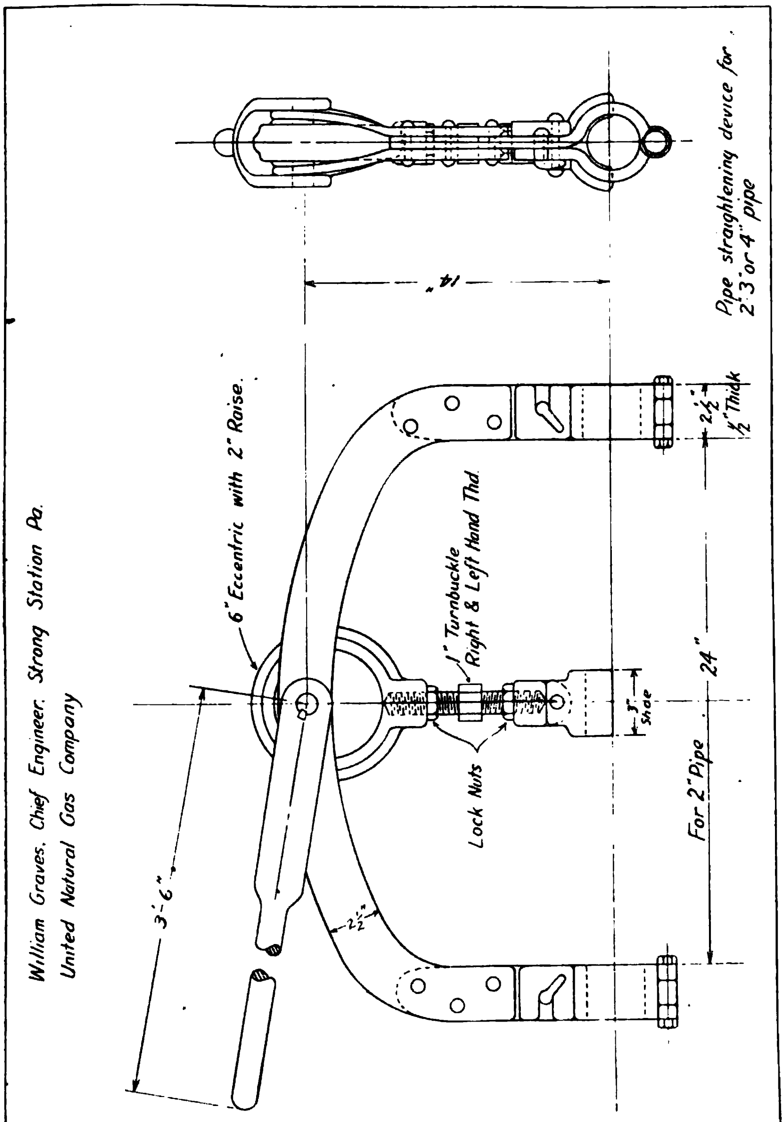
In case two taps are made, some distance apart, to supply the same a meter space could be left at each. In many instances leakage could thus be checked by one or two meters, on mains and service lines, supplying as many as two or three hundred consumers. This plan should also always be used on a long, privately owned line.

WRINKLE NO. 149

PIPE STRAIGHTENING DEVICE

WM. GROVES, UNITED NATURAL GAS CO., STRONG, PA.

The pipe straightening device described in the drawing may be used for 2″-3″ on 4″ pipe.



Wrinkle No. 149

WRINKLE NO. 150

EQUALIZATION SYSTEM OF CHECKING

F. W. PHILLIPS, THE OHIO FUEL SUPPLY CO., COLUMBUS, OHIO

Below is shown briefly the equalization system of check which I have worked out, with the assistance of some high-priced specialists and the experience gained in our department.

I am glad to submit it as a wrinkle in order that the entire gas fraternity may benefit in mathematical matters.

This equalization check is as accurate as the rule of nine and can be applied more rapidly. For vertical addition, this check is an absolute failure, but on all other calculations it is a 99% check. In extending bills, multiplication, cross-footing, division, etc., it will not catch a *transposition,* an *error of position,* a *misplaced decimal or an extra or omitted o* and has the *same weaknesses* all the way through as the rule of 9.

PAYROLL DISTRIBUTION,

CROSS-FOOTING AND COUNTER-BALANCING

	(1)	(2)	(3)	(4)	(5)	Totals
(E)	4.16	7.19	12.47	61.75	61.29	146.86
(F)	9.74	124.87	1,474.31	967.00	48.77	2,624.69
(G)	6.51	51.69	84.11	99.67	39.10	281.08
		Total	....			3,052.63

EQUALIZATION CHECK

To audit totals Lines E—F—G and Grand Total.

Line E

Add all digits in Line E (1 to 5) 416719124761756129=79. Re-adding digits 7 plus=16. Proof figure 1 plus 6=7, and checks the sum of digits in the total for Line E reduced to proof figure (7).

Line F

Sum of digits=110=2, which is the proof figure and checks with proof figure of total=29=(2).

Line G

Sum of digits=91=1, which is the proof figure and checks with proof figure of total=19=(1).

Grand Total

Sum of proof figures E—F—G Totals=7 plus 2 plus 1=10=1, which is the proof figure and checks with the proof figure of the grand total=19=1.

DEBIT, CREDIT AND BALANCE

	Dr.	*Dr.*	*Dr.*	*Cr.*	*Cr.*	*Balance*
(A)	2.84	3.75	2.16	.55	2.34	5.86
(B)	14.75	32.54	16.75	22.31	10.22	31.51
(C)	282.16	525.41	328.15	262.11	125.32	748.29
			General Balance	....		785.66

EQUALIZATION CHECK

To Audit balances.

Line A

(Sum of *Dr.* digits reduced to proof figure=2) less (Sum of *Cr.* digits reduced to proof figure=1)=1. Proof figure is 1, and checks the sum of digits in balance A reduced to proof figure=(1).

Line B

Proof figure *Dr.* (50=5) less *Cr.* (13=4)=1, which is the proof figure and checks with the proof figure of the Line B balance=(1).

Line C

Proceed as above, balance proof figure=(*3).

(*When first proof figure is smaller than second, add 9 to first proof figure.)

General Balance.

Add proof figures 1-1-3=5, which is the proof figure and checks proof figure of the total, which is 5.

ANALYSIS SHEETS

VOUCHERS

BILL, EXTENSION AND INVENTORY

	Quantity		*Price*		*Total*
(A)	484	@	3.85		1,863.40
(B)	286	@	1.84		526.24
(C)	288	@	.4475	($44\frac{3}{4}$)	128.88
(D)	164	@	.325	($32\frac{1}{2}$)	53.30
			Total		2,571.82
			Discount		121.20
			Net		2,450.62

EQUALIZATION CHECK

To audit items—totals (gross and net).

Line A

Proof figure *quantity*=7 multiplied by the proof figure of the *price*, which is 7=proof figure of 4, and checks proof figure for total=(4).

Lines B-C and D

Same as above. The sum of these proof figures checks with the proof figure of total. The proof figure of total less proof figure of discount checks with proof figure of net total. In this connection please note that proof cannot be used where decimals are dropped.

STRAIGHT MULTIPLICATION

```
A-     42578
B-      3765
       ------
      212890
     255468
    298046
   127734
   ---------
   160306170
```

EQUALIZATION CHECK

To audit product.

Proof Figure A=(8) multiplied by proof figure B, which is (3)= proof figure (6), which checks with the proof figure of the final product=(6). Separate checks may be applied to each sub-product in the same way but the loss of time resulting therefrom, is sufficient to warrant another complete multiplication.

DIVISION

To audit quotient and remainder.

```
      130813
    /-------
  67/8764527
     -------
Remainder 56
```

EQUALIZATION CHECK

Proof figure divisor=(4).
Proof figure quotient=(7).
Proof figure remainder=(2). (4x7 plus 20=proof figure (3), which checks proof figure of dividend which is (3).

VERTICAL ADDITION

EQUALIZATION CHECK

To audit sums.

Consists of adding digits of all numbers contained in the total and obtained proof figure which checks with the proof figure of the total.

Wrinkle No. 150

WRINKLE NO. 151

WELDED GAS WELL DRIP

W. T. YOUNG, UNITED NATURAL GAS COMPANY, OIL CITY, PA.

This drip has been used very successfully by this company for a number of years as a gas well drip.

The principle feature of this drip is the fact that it is welded, which obviates the chances of leaks developing, and another feature worthy of mention is the anti-freeze blow-off, which consists of a syphon pipe reaching to near the bottom of the drip, and near the top end of which is a small hole drilled which serves as a pressure equalizer. In the event that leakage develops in the blow-off cock, this will prevent the water from raising up in the syphon or blow-off pipe and freezing.

In cases where a well produces a large amount of water, it may be necessary to insert additional storage, which is known as a ground joint.

The full details of this drip is shown on drawing No. B-129.

WRINKLE NO. 152

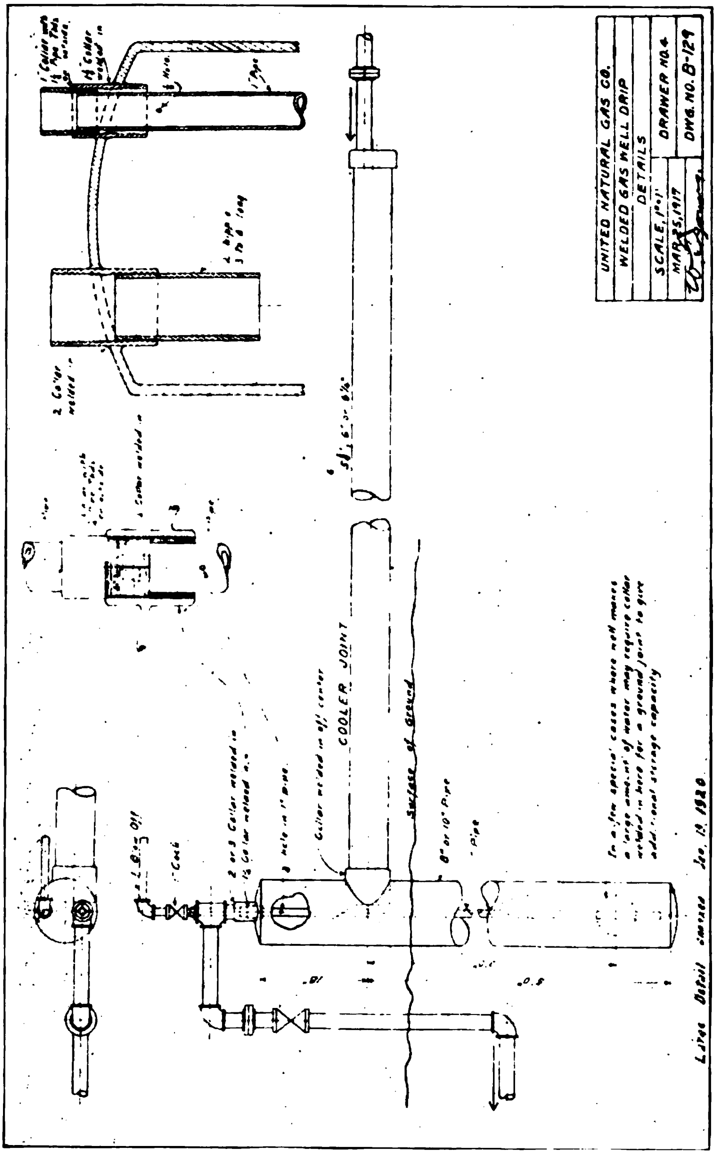
TELESCOPE ONE POLE DERRICK

C. H. ADAMS, UNITED NATURAL GAS CO., KANE, PA.

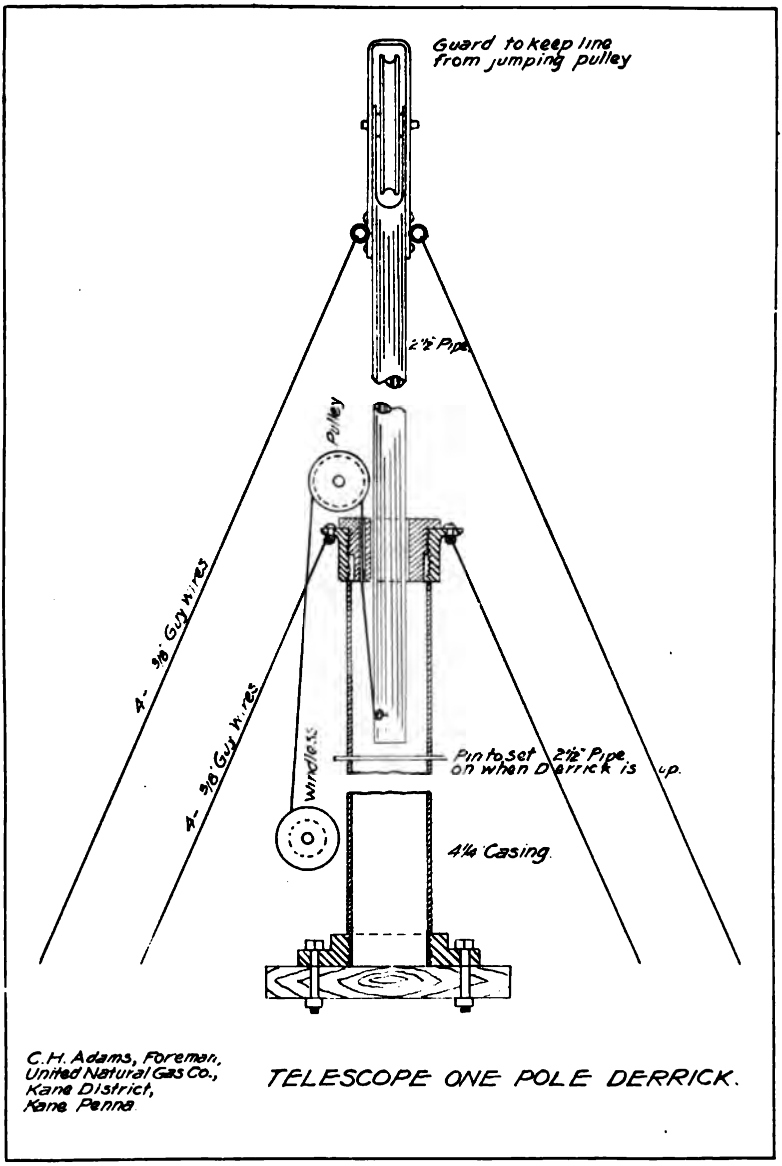
The sketch shows a telescope one pole derrick which we are using in the Kane field in connection with our bailing machines.

This outfit is not very heavy and is easily moved from well to well on the same wagon on which the machine is mounted.

While the construction of this derrick discloses no new ideas, it is inexpensive, convenient and an outfit that any field man can make himself.



Wrinkle No. 151



Wrinkle No. 152

WRINKLE NO. 153

REINFORCED BELT WHEEL

W. A. Hovis, United Natural Gas Co., Clermont, Pa.

I have reinforced belt wheels by making a 1-inch square iron ring and shrinking it on the hub of the wheel, after drilling and tapping the ring to receive three ⅝ inch bolts or spokes. I then drilled the cast iron rim, or face of the wheel, and screwed in ⅝ inch false spokes and hot riveted the ends in the face of the wheel.

I did this on each side of the wheel and find that it stiffens the wheel so that it gives perfect service and I have not had any wheels give out since.

WRINKLE NO. 154

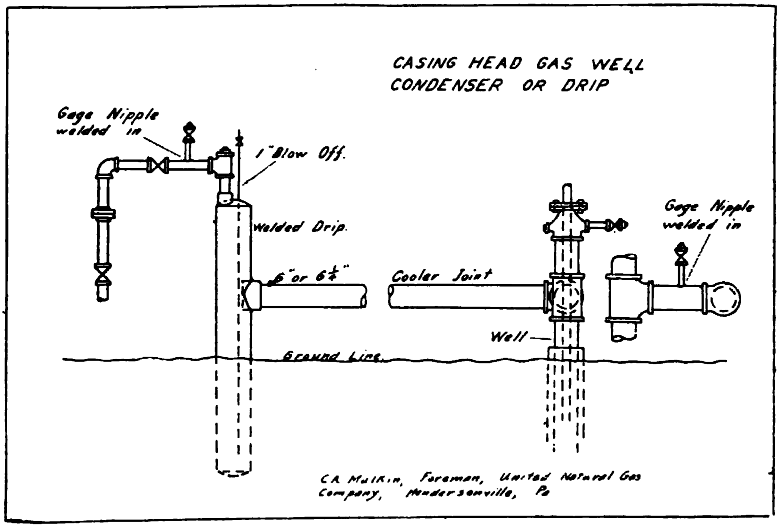
CASING HEAD GAS WELL CONDENSER OR DRIP

C. A. Mulkin, United Natural Gas Co., Hendersonville, Pa.

After keeping a record of our freeze-ups, I found that about eighty per cent of them occurred in the small fittings between the well and the drip.

By removing all of the small fittings between the well and the cooler joint of the drip and screwing a 6¼ inch tee on the casing of the well, about 6 to 12 inches above the ground, and coming out the side of the tee with a 6¼ inch nipple and an ell, and screwing the cooler joint into the ell, we could then screw the drip on the cooler joint without using a union or a sleeve. The cooler joint should vary in length depending on the flow of the well. In any case the cooler should be long enough for the water or gasoline to separate from the gas and the gas to become normal in temperature, in comparison with the outside atmosphere, before it reaches the drip.

In cases where old wells are to be connected in this manner, a 6¼ inch nipple can be used between the tee and the casing head, as shown in the sketch. But in connecting new wells, a tee-casing head could be made, or a casing head with a 6¼ inch side opening. In the event that the well is producing thru



Wrinkle No. 154

tubing, a swedge nipple can be used in place of the 6¼ inch nipple

When more than one joint of cooler is used, it is a good plan to put one or two cement blocks under the middle of it, to relieve the strain.

WRINKLE NO. 155

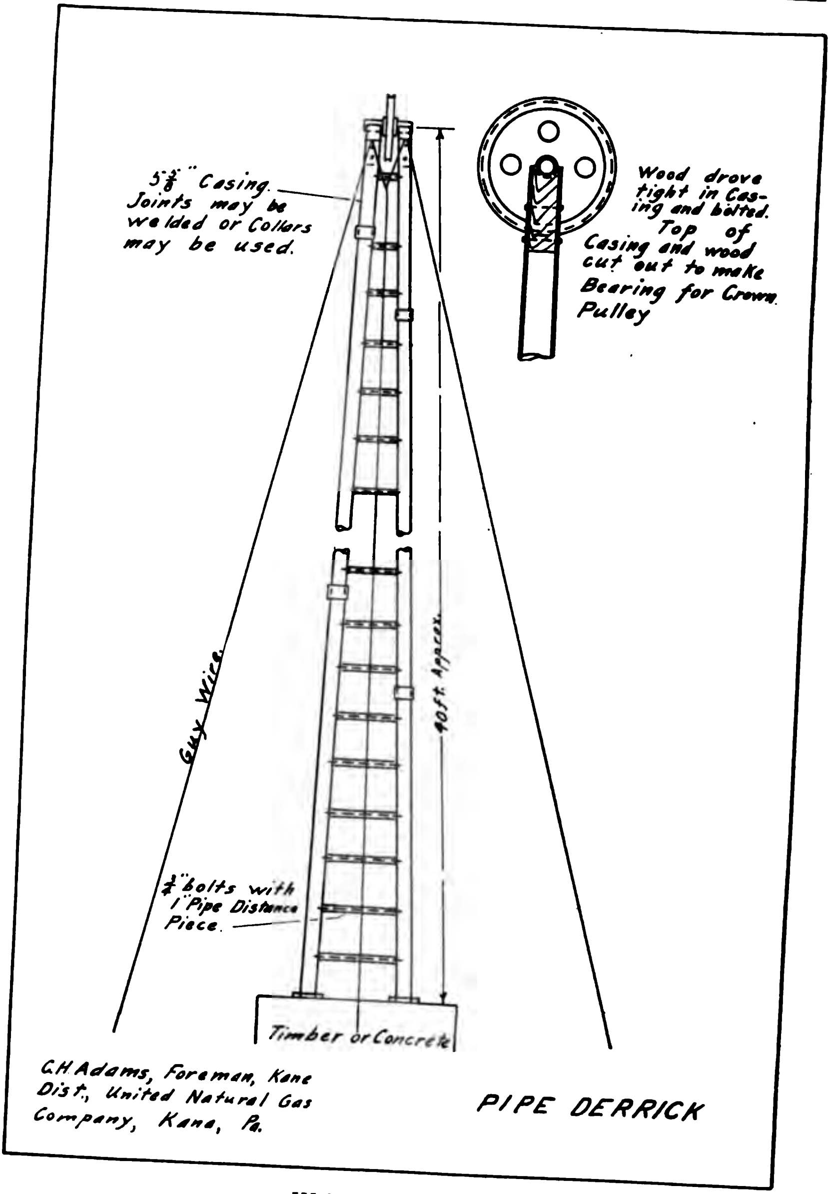
PIPE POLE DERRICK

C. H. Adams, United Natural Gas Co., Kane, Pa.

This derrick can be made of either 5⅝ or 6¼ inch second hand casing. We usually make them about 40 feet high (about two joints and a half of pipe being used).

The top ends of the pipe are brought together within about 4 inches, with sufficient opening to permit an old crown pulley to fit between the two uprights.

In the top end of each upright is driven a wooden plug about two feet long. These plugs are bolted firmly in position with two bolts thru each leg. The top of each leg, or upright,



Wrinkle No. 155

and the wooden block is cut out to form the bearing for the crown pulley.

The bottom of the two uprights are separated from 30 to 36 inches. A 7/8 inch hole is drilled thru each leg about every 18 inches, thru which is put a 3/4 inch bolt, and between each leg is a 1 inch pipe distance pieces of suitable length. These act as a stiffener and a ladder. The derrick is thoroughly guyed.

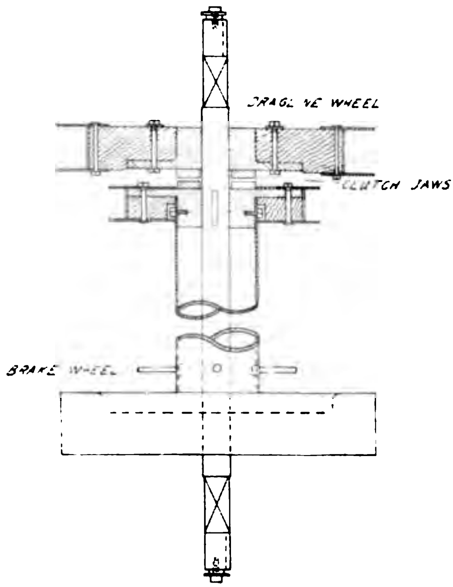
This derrick may be set on a concrete foundation or on timbers, whichever is most convenient. We often use an old bull wheel or sand reel gudgeon for a bottom bearing for the legs.

WRINKLE NO. 156

SPECIAL BULL WHEELS FOR PULLING MACHINE

C. C. Lynn, United Natural Gas Co., Shippensville, Pa.

The improvement of these bull wheels over the type that comes with the original machine, is that the drag line wheel



Wrinkle No. 156

is separated from the rest of the bull wheels, and is connected thereto with a jaw clutch as illustrated in the drawing.

When we have occasion to pull a wire line out of a well, the operation is a very easy one. You fasten your pump line to the shaft, the same as you would fasten your tubing line, then hitch the team to the pull line. Pull your team to the end of the pull line, and by the time the team has returned to the machine, one man can have the line spooled back and the clutch

Wrinkle No. 156

in, ready to go again. We have pulled an 1800 foot line out of a well in 50 minutes. When you are pulling tubing, especially where there is a packer on, and you will likely have to pull six or eight joints that drag heavily and you find it necessary to use several ground lines, by the time you have gotten one joint out, your team is 500 or 600 feet from the machine. With the new clutch, your team can always be at the machine, for the reason that when you get one hundred feet, or so, you can hold the load with the brake and bring your team back to the machine.

Where the well is located on a lot that does not afford much room to pull, the clutch pull wheel is certainly a fine improvement over the old wheel and I can highly recommend this clutch to any one using a pulling machine with a bull wheel.

WRINKLE NO. 157

WEBSTER 2¼ HORSE POWER ENGINE CONVERTED INTO AN AIR COOLED ENGINE

C. C. LYNN, UNITED NATURAL GAS CO., SHIPPENSVILLE, PA.

This change is made by cutting out the side of the water jacket and attaching thereto a bell shaped casting in which a fan is mounted, and is in turn driven by a round belt from the fly wheel; the fly wheel being grooved to receive the belt.

The opposite side of the water jacket is drilled with several holes for the outlet of the air. The 1-inch connection in the bottom head is also removed for additional outlet.

WRINKLE NO. 158

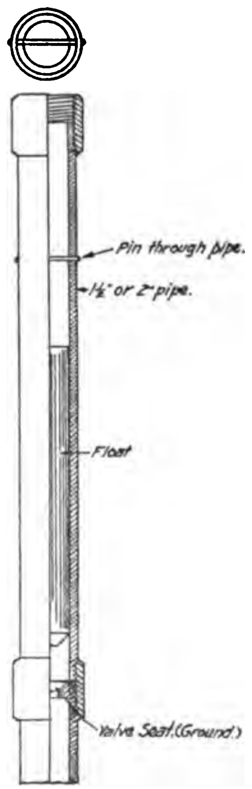
FLOAT VALVE USED IN CONNECTION WITH INSERTED WORKING BARRELS

W. A. HOVIS, UNITED NATURAL GAS CO.,
CLERMONT, PA.

The sketch shows a float valve used in connection with inserted working barrels, where it is not desirable to allow the fluid in the tubing to rush back in the well when removing the inserted barrel for repairs.

This float valve consists of 18 inches of either 2-inch or 1½-inch pipe with a steel float inside, which is about 10 inches long. In the center of the collar on the bottom end of the pipe is screwed a seat to engage the end of the float which is carried down to the seat when the inserted barrel is removed by the rush of the water. This float has a half ball on the lower end and is ground in the seat and makes a tight joint. This is placed on the tubing below the working barrel or working barrel seat.

The advantage of this float valve is that having considerable travel, and the fact that it remains away from the seat while



Wrinkle No. 158

the well is pumping. If the well is not being pumped, the valve will not clog with sand and dirt, as does the ordinary standing valve. I have used these valves for several years and find them to be a success. They are manufactured by the McGregor Working Barrel Company, Bradford, Pa., and can be purchased there.

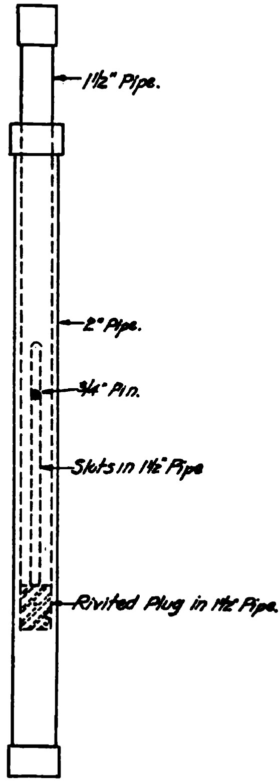
A cross member near the top of the pipe keeps the float from leaving the container. I have found that this valve prevents wells from caving to a great extent by retaining the fluid in the tubing. It also saves the time of repumping the fluid to fill your tubing. This valve is made in either 2-inch or 1½-inch for either size tubing.

WRINKLE NO. 159

A SET OF JARS MADE FROM 1½ INCH AND 2 INCH PIPE

M. G. Oakley, United Natural Gas Co., Clermont, Pa.

Having use for a small set of jars to run on tubing and to fish out packer rubbers, I made use of the set of jars shown in sketch, as follows:



Wrinkle No. 159

I riveted a solid head in a piece of 1½" pipe, and slotted this pipe to work over a ¾" pin, which I riveted thru a piece of 2-inch pipe. I gave the jars about an 18-inch stroke by slotting the 1½-inch pipe to this length.

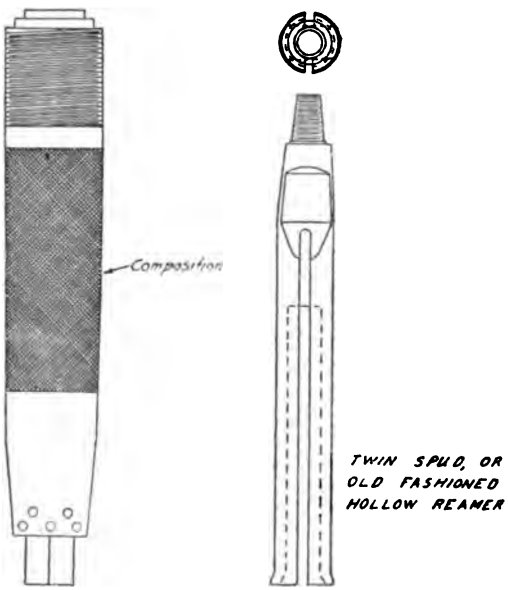
These jars have been in use for several years and give entire satisfaction.

WRINKLE NO. 160

TO REPLACE LEATHER RINGS ON THE STANDING VALVES OF INSERTED WORKING BARRELS

W. A. Hovis, United Natural Gas Co., Clermont, Pa.

We use a composition of 25% No. 4 babbitt and 75% lead, which is run around the barrel of the valve, by using a tapered sleeve large enough to leave sufficient stock for finishing on a lathe.



Wrinkle No. 161

This has proven to be a big improvement over the leather rings, as it allows the valve to be used several times, while the rings usually pull off when the barrel is removed for repairs.

No material is lost, as we use the composition again by melting off and reapplying.

WRINKLE NO. 161

TWIN SPUD

F. H. ROTE, UNITED NATURAL GAS CO., CRANBERRY, PA.

This tool has been in use by our company for several years and was made in a local shop.

While this particular tool was made for 5⅝-inch hole, it is simply a matter of changing dimensions from larger or smaller. It is used for cleaning out down over 2-inch tubing. It will clean out mud, stones, iron, etc., around the tubing without damaging the top of the tubing, and if the tubing stands to the side of the hole, it will slip down over it and straighten it up so that a combination socket will catch it.

The tool can be dressed to the full size of the hole and will spring together and go thru tight places without sticking.

We have used it to clean out on top of the packer and have dressed the jacket off the packer with it so that we could get a grip on the packer.

This tool will pick up rubber, tubing slips, bolts or any small piece of iron that may have been dropped in the well.

In my estimation it is the best tool I have ever seen for the purpose for which it was designed, and every cleaning out string should have one.

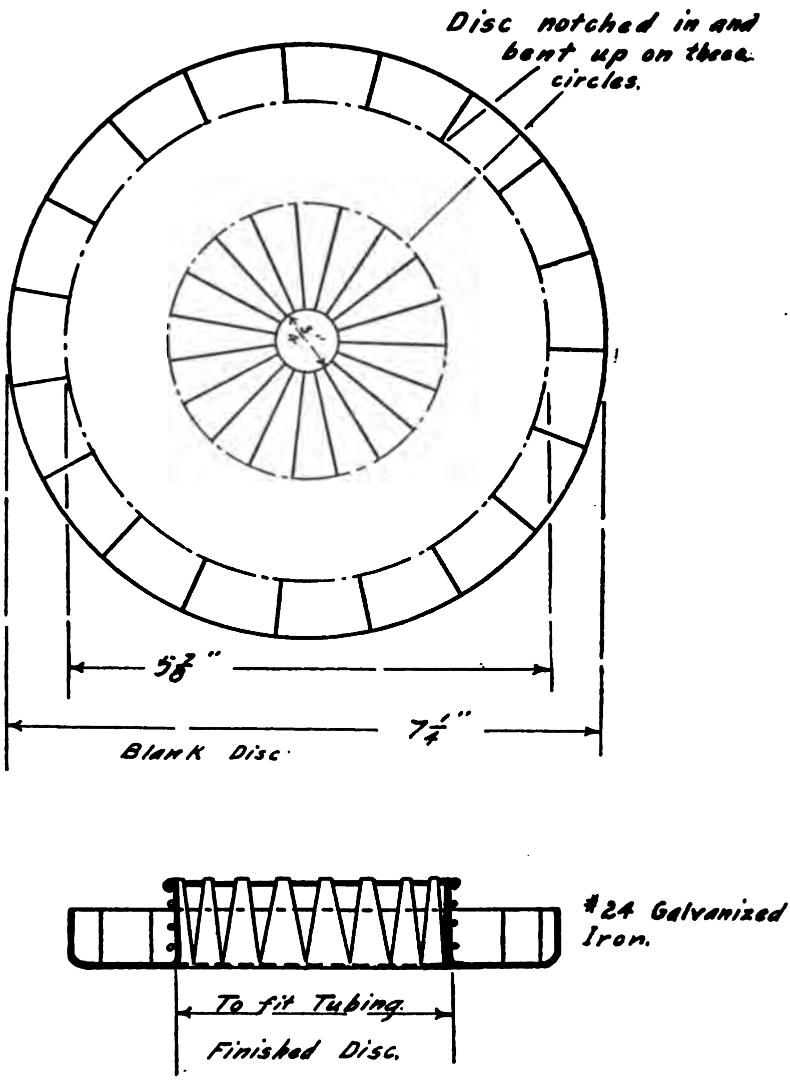
WRINKLE NO. 162

DISK TO PREVENT CAVE-INS DROPPING DOWN WELL HOLE

R. B. BARNES, UNITED NATURAL GAS CO., BROOKVILLE, PA.

The purpose of this disk is to prevent cave-ins from dropping down and covering the producing sand. It is not intended to prevent water from going to the bottom of the hole, but simply to hold up the cavings, and can be used on any size tubing, particularly where a hook wall or disk packer is set a considerable distance above the producing sands, as frequently the wall caves below the packer and as before stated, will fill up the pocket and cover the sands.

When a hook wall or disk wall packer is used, the ordinary bottom is tapped out or a special bottom is put on, and a string of pipe suspended to the necessary depth.



Wrinkle No. 162

This may be of any old pipe or tubing, just so it has sufficient tensile strength to carry its own weight, and then one of these disks are put on about every fourth or fifth joint.

Care should be used to see that the bottom joint is belled out so that the bailer will not become caught in pulling out.

WRINKLE NO. 163

WELL DRIP OR CONDENSER FOR CASING HEAD GAS WELL

C. C. Lynn, United Natural Gas Co., Shippensville, Pa.

In order to overcome the difficulty in wells freezing up both in the well line and in the casing head, particularly in wells on which there was a vacuum, we have found the following appliance would overcome the difficult:

This drip is not intended for use on any well that is actually producing water, but only on such wells where trouble is caused by the condensation and freezing of the vapor, and consists of simply the casing extended up in the air for about one joint, in which a 2-inch nipple is welded. And where our welding outfit is not available, to insert thru a tee and bushing, a 2-inch pipe reaching nearly to the top of the cooler joint.

This drip is especially suitable where there is no pumping outfit required.

For the application of this principle, where a pumping outfit is used, please refer to the well drip idea submitted by Mr. C. A. Mulkin. (Wrinkle No. 154, page 231.)

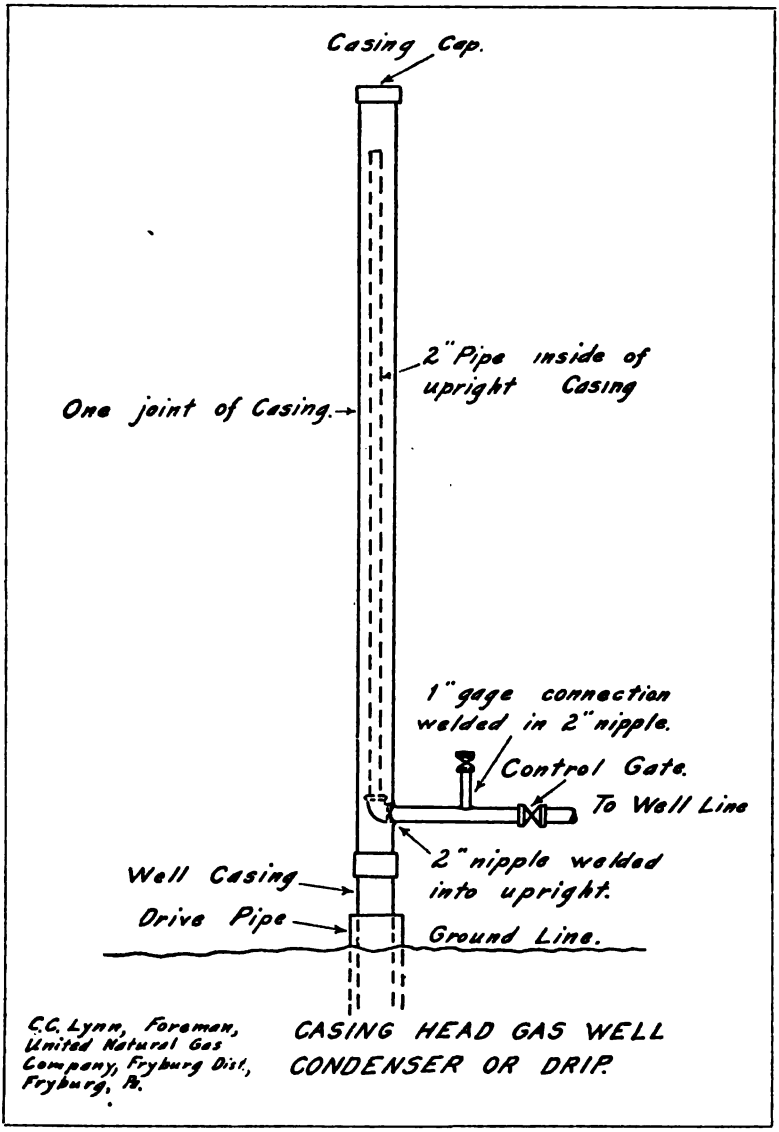
WRINKLE NO. 164

ATTACHMENT FOR CLEANING OUT WELLS THRU THE TUBING, WHERE A BAILING AND PULLING MACHINE IS USED TO FURNISH THE POWER

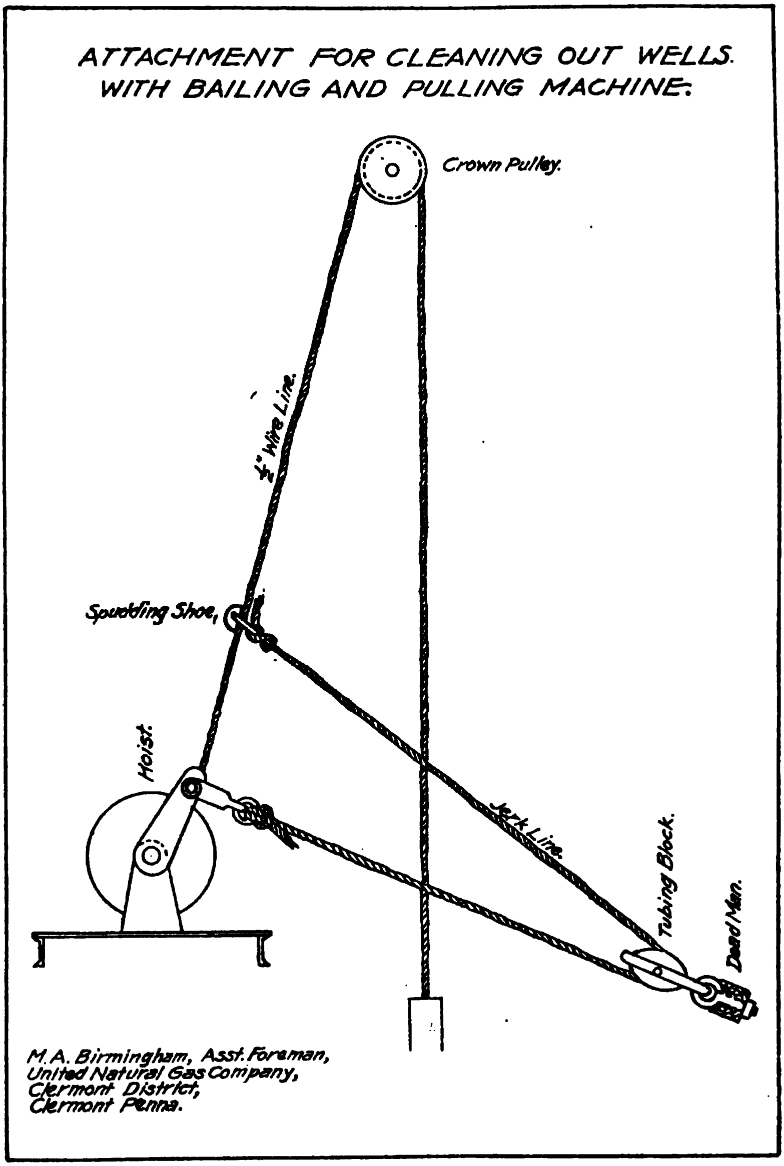
M. A. Birmingham, United Nat. Gas Co., Clermont, Pa.

We use a small hand made string of tools and a 1½" sand line to do the work.

A crank is installed on the shaft of the hoist and a jerk line is used which is run thru a tubing block, which is anchored



Wrinkle No. 163



Wrinkle No. 164

to a dead-man in front of the well. The well being between the machine and the 'dead-man". The operation is then identical to spudding with a standard drilling rig, and the tools are operated with ease and perform their work successfully. We have cleaned as much as 300 feet of cavings in a 6¼" hole below the packer.

We use a wooden spudding shoe which we bridle down to the machine to keep the shoe from working or slipping on the line, and the use of the shoe does not wear the line.

We have cleaned out several wells with this attachment and have saved the expense of moving in a standard rig to do the same work.

WRINKLE NO. 165

WHEN REPAIRING CASING, A METHOD TO ASCERTAIN WHERE THE CASING IS UNSCREWING IN THE WELL

B. A. Pyle, United Natural Gas Co., Petrolia, Pa.

Locate where the hole is in the casing, if possible, or if you are familiar with the formations, one can pretty nearly tell from experience where the hole will probably be.

Now take a hook wall packer frame only—i. e., one without a rubber, and run on a string of tubing. Set it at the point slightly above where you wish to unscrew.

Now set up your casing until the 2-inch pipe turns. This will indicate to you that a joint is broken below your packer frame.

Next try unscrewing the casing, and if the tubing turns, it will indicate to you that it is unscrewing below your packer frame.

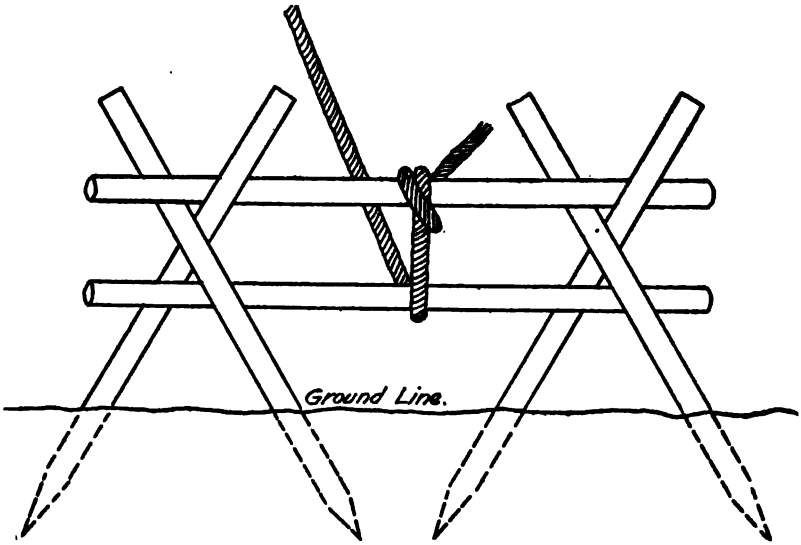
After making several rounds on your casing, you should then unlatch the packer frame and withdraw the tubing and packer, after which finish unscrewing the casing and pull.

WRINKLE NO. 166

METHOD OF USING ANCHOR STAKES IN LOOSE OR STONY GROUND, WHERE A SINGLE STAKE WILL NOT HOLD

W. A. Hovis, United Natural Gas Co., Clermont, Pa.

The stakes shown in sketch cannot pull out without lifting the ground with them. This method saves digging and placing 'deadmen" to do the same work.



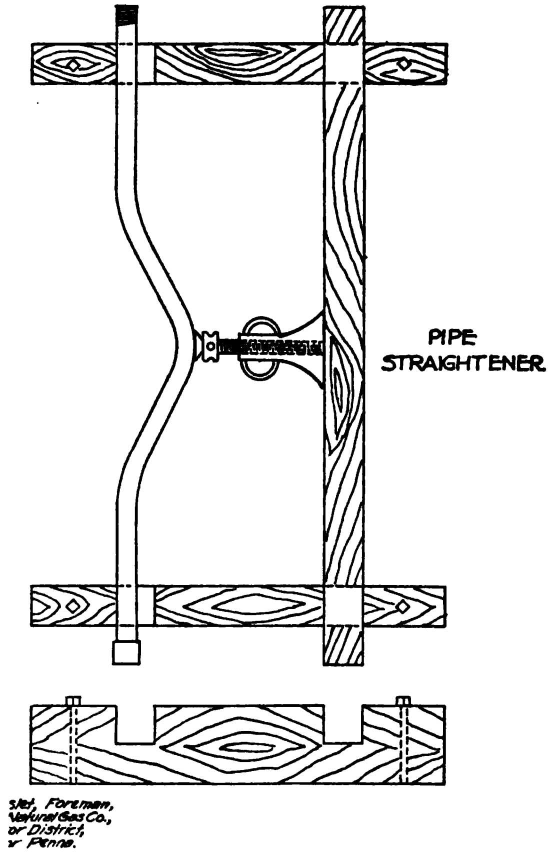
Wrinkle No. 165

WRINKLE NO. 167

PIPE STRAIGHTENER

E. W. Haslet, United Nat. Gas Co., Endeavor, Pa.

This device will be found very convenient for straightening pipe. The size illustrated is heavy enough for 4-inch pipe. The end pieces are so arranged that they will move in or out.



Wrinkle No. 167

WRINKLE NO. 168

A WIRE LINE POLISH ROD MADE FROM ¾-INCH PIPE

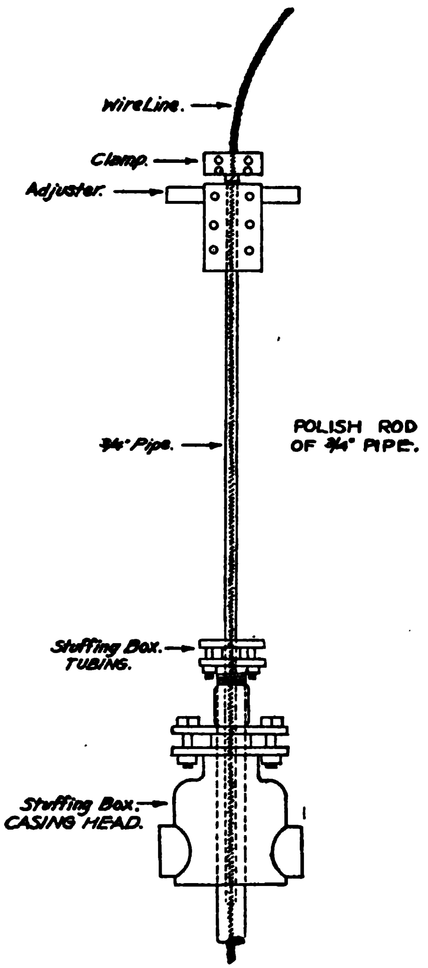
M. A. Birmingham, United Nat. Gas Co., Clermont, Pa.

About six feet of old ¾ inch pipe is used, placing same in a lathe and polish it until it is smooth.

Saw a ¾ inch collar in two and attach it to one end of the pipe.

This pipe will be 1⅛ inch O. D. and will fit in the polish rod adjuster for Klein pumping powers. It is then necessary to use above the ¾ inch half collar another clamp to hold the wire line as shown in the sketch.

You can then use the regular 1⅛ inch polish rod stuffing box on your tubing.



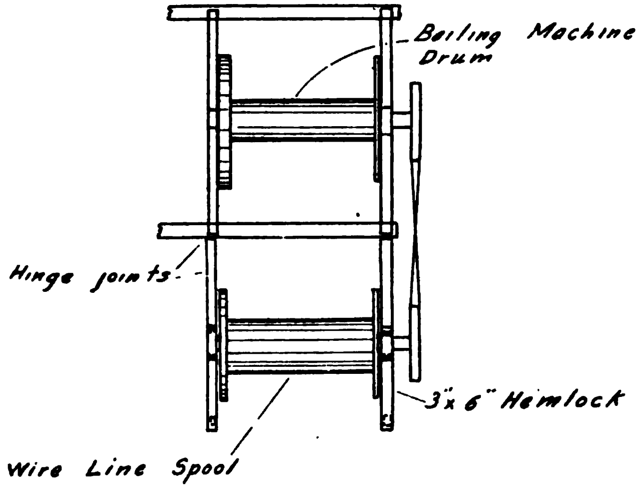
Wrinkle No. 168

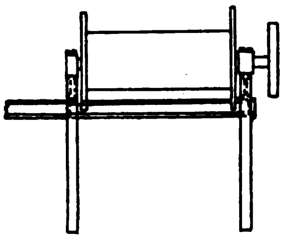
WRINKLE NO. 169

ATTACHMENT FOR REELING WIRE PUMPING LINES FROM PULLING AND BAILING MACHINES

M. A. Birmingham, United Nat. Gas Co., Clermont, Pa.

An extension frame is made from 3" x 6" hemlock plank with legs to support the outer ends. The other ends are attached with a hinged joint to the frame of the baling machine.





Wrinkle No. 169

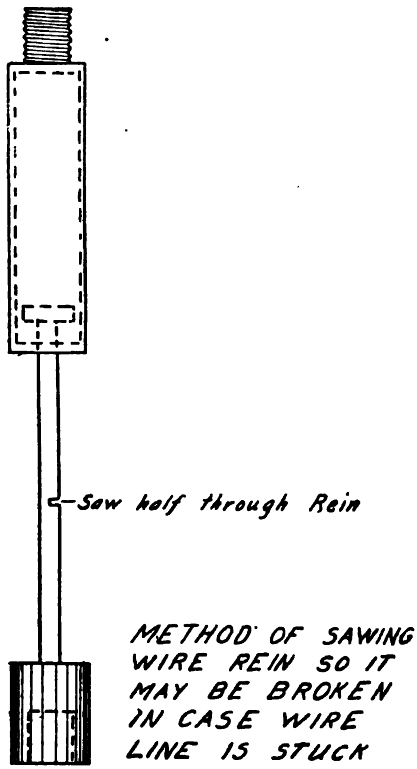
The spool is revolved with a belt from the drum shaft and it is possible to quickly remove a wire line from the machine after pulling same from the well to allow the use of the tubing line on the drum. The pumping line is later respooled on the drum for returning to the well.

WRINKLE NO. 170

METHOD OF SAWING THE JAR REIN ON WIRE LINE PUMPING JARS SO THAT THEY CAN BE JARRED OR PULLED IN TWO WHEN WIRE LINE IS STUCK AND CANNOT BE PULLED

W. A. Hovis, United Natural Gas Co., Clermont, Pa.

The sketch shows the method of sawing the jar rein on wire line pumping jars so that they can be jarred or pulled in two when wire line is stuck and cannot be pulled. This wrinkle saves the pulling of the line and tubing together, and avoids a loss of time and the elimination of a dangerous practice.



Wrinkle No. 170

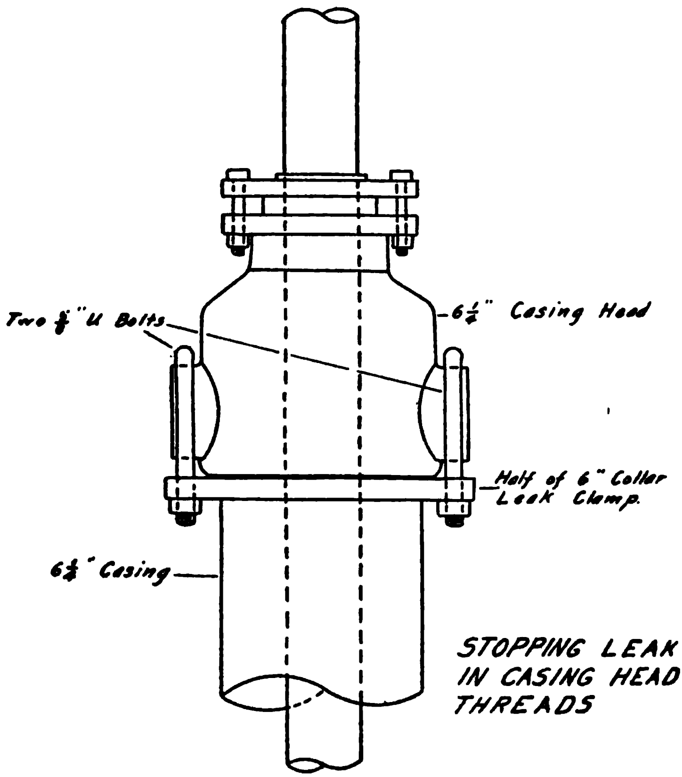
WRINKLE NO. 171

TO STOP A LEAK IN THE THREADS OF A CASING HEAD WHERE THE HEAD IS SCREWED ON THE CASING

W. A. Hovis, United Natural Gas Co., Clermont, Pa.

Use one half of a 6″ collar leak clamp with the ordinary collar leak rubbers, using a full size rubber and splitting a rubber in two, to bring the rubber above the top of the clamp. Use two U bolts of ⅝ inch stock of the right length and shape to fit over the side openings of the casing heads.

We have successfuly stopped several leaks in this manner.

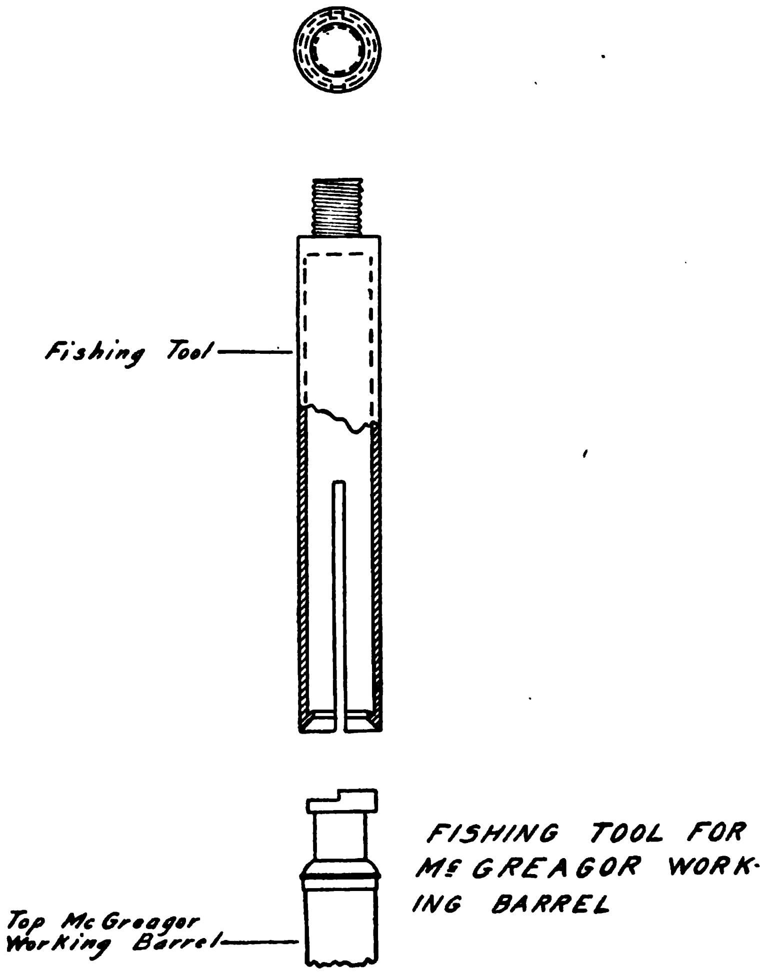


Wrinkle No. 171

WRINKLE NO. 172

A FISHING TOOL MADE FROM AN OLD "LET-GO" FOR WIRE LINES

M. A. Birmingham, United Nat. Gas Co., Clermont, Pa.



Wrinkle No. 172

The sketch shows a fishing tool made from an old "Let-go" for wire lines. This tool was made to catch the top of McGregor working barrels when the top of the valve rods break and allow the rod to drop inside of the barrel.

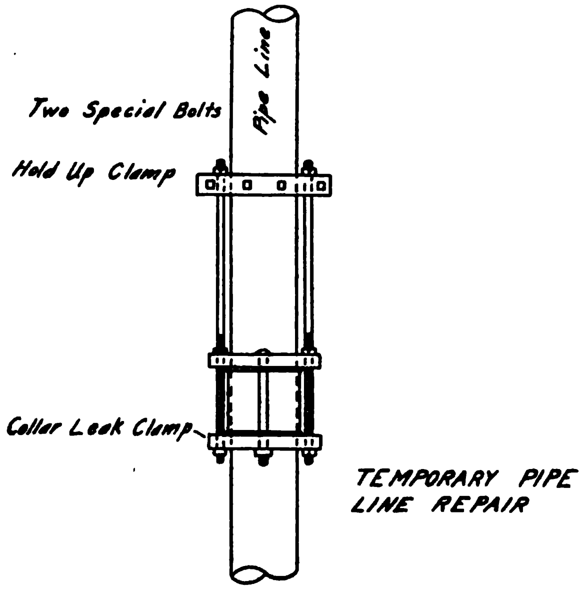
The tool is made as shown and the slots allow the tangs to spring sufficiently to slip over the shoulder on top of the barrel. We have been using this tool with good success for several years.

WRINKLE NO. 173

TO TEMPORARILY REPAIR A BROKEN LINE WITH THE USE OF A COLLAR LEAK CLAMP AND A 2-INCH HOLD-UP CLAMP

M. A. Birmingham, United Nat. Gas Co., Clermont, Pa.

The sketch will show how we have repaired broken lines temporarily with the use of a collar leak clamp and a 2-inch hold-up clamp.



Wrinkle No. 173

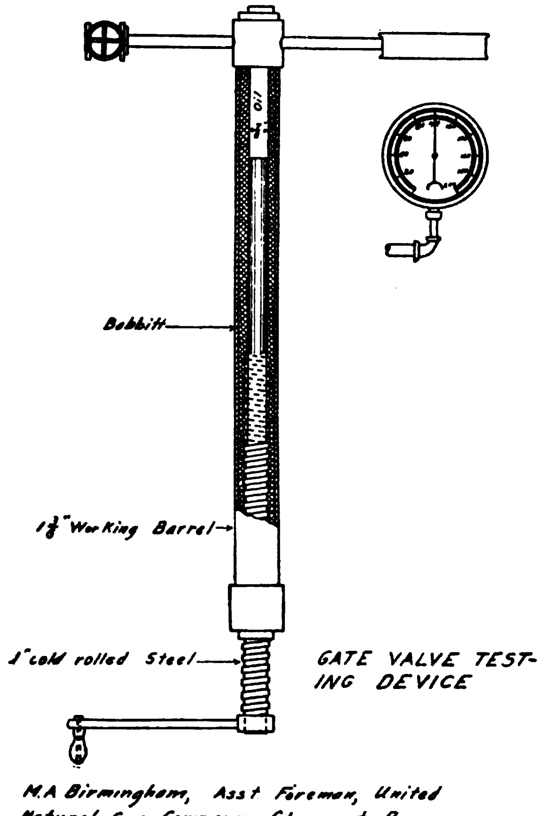
WRINKLE NO. 174

TESTING GATE VALVES WITH OIL PRESSURE

M. A. Birmingham, United Nat. Gas Co., Clermont, Pa.

The sketch will illustrate a wrinkle for testing all kinds of gate valves with oil pressure, up to the rated capacity of the valves. We subject Ludlow gate valves to a test of 1,000 pounds.

Use 2 feet of old 1⅜ inch working barrel, and thread 2 feet of 1 inch cold rolled steel about half its length, and then turn the remainder of the steel to ⅞ inch diameter. Place a bushing



Wrinkle No. 174

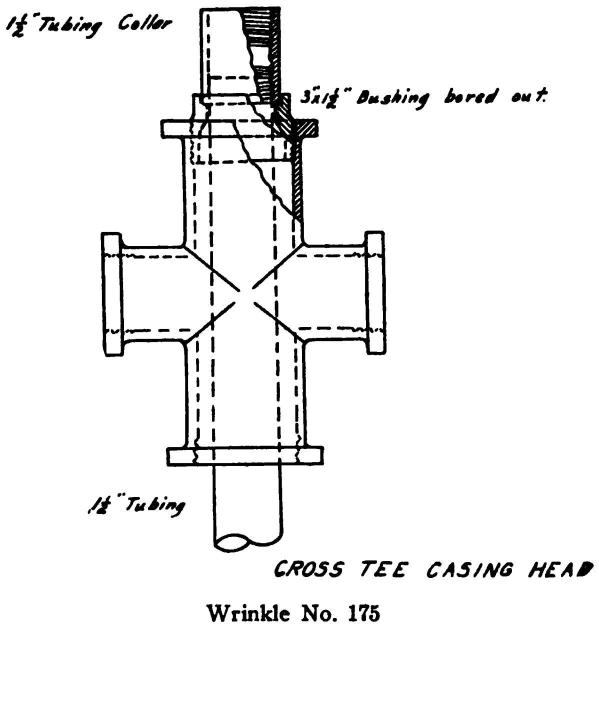
in the end of the collar, on one end of the barrel, and tap it to admit the screw, then fill the barrel with babbitt. This will make a tight and long thread and a tight piston. By using a collar on the opposite end and tapping it on opposite sides for the gauge and gate valve connections, and plugging the end of the collar and filling with oil—first screwing the piston out and then attaching the gate valve and the gauge, and you can get any pressure you wish.

WRINKLE NO. 175

TO USE A 3x2 INCH CROSS TEE IN PLACE OF A 3x1½ INCH STUFFING BOX CASING HEAD

W. A. Hovis, United Natural Gas Co., Clermont, Pa.

All the material that will be required is a 3" x 1½" cast iron bushing (heavy) and a 1½" collar. Turn the bushing out so that 1½" pipe will slide thru, and turn a true seat about ¼" wide on top of the bushing. Then turn and face off true a 1½" collar that will just nicely fit in the seat in the bushing.



Wrinkle No. 175

For a gasket, a ring made of ⅛″ or 1/16″ Rainbow gasket material should be used, and the ring slipped over the last joint of 1½″ tubing, and you will have as good a job as if you had made use of a regular casing head.

WRINKLE NO. 176

SHOP LIGHTING OUTFIT

M. A. BIRMINGHAM, UNITED NAT. GAS CO., CLERMONT, PA.

Our shop being small and dark, we often needed an extension light for repairing automobiles and machines of different kinds. We took an old Ford motor, which had been junked, and inverted it, as shown on the sketch, and operated it off our line shaft. This makes sufficient light for two extension lights for use in any kind of work, either at the lathe or repairing cars on dark days. A guard, not shown in the sketch, is placed over the revolving crank shaft, so that there will be no danger of anyone being injured. The outfit is placed on the wall shelf out of the way of other machinery. A three-shift pulley is attached to the end of the crank shaft to revolve it.

WRINKLE NO. 177

WELL GAUGE NIPPLE SAVING FITTINGS

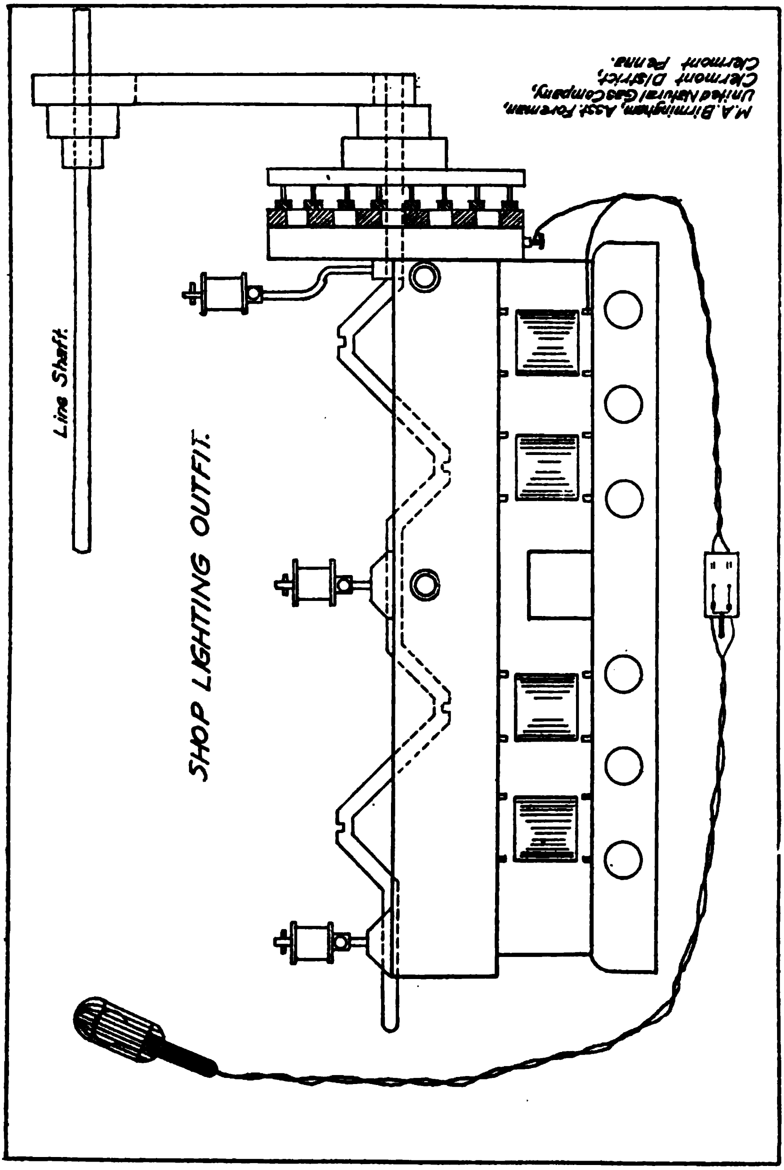
GLEN H. KINCH, UNITED NAT. GAS CO., SO. OIL CITY, PA.

This wrinkle is to save fittings and thereby, leaks.

In order to gauge a well, or to test it, it has been the custom of this company to put a 2 x 1″ tee on the inlet side of the control gate. This necessitated two nipples and a 2 x 1″ tee.

We are now using, to good advantage, a welded nipple about 18 inches long, with a 1-inch nipple welded into it from 6 to 8 inches from the end, and thereby saving the price of a tee and three joints, with that many chances for leakage.

This same type of welded nipple can be used on the outlet side of the gate also, of such a length as will suit the conditions.



Wrinkle No. 176

WRINKLE NO. 178

SUPPORT FOR PIPE LINE OVER CREEK OR RAVINE

B. A. PYLE, UNITED NATURAL GAS CO., PETROLIA, PA.

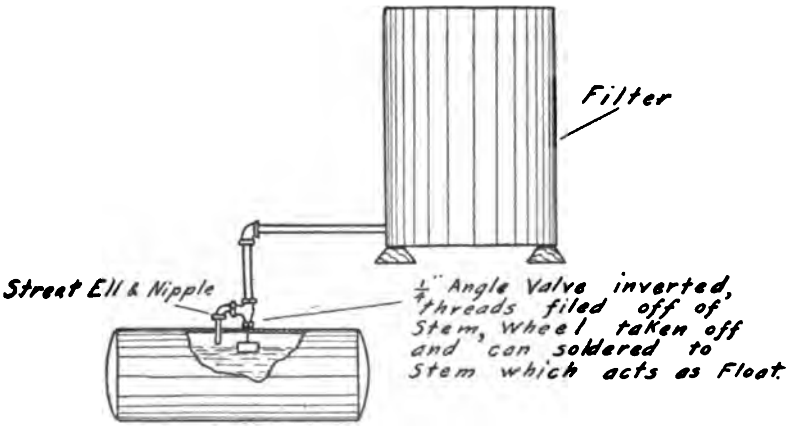
The drawing shown herewith will explain the details of this wrinkle; the principal feature of which is instead of burying "deadmen", the cable is anchored to the line itself by means of clamps. This is of particular value in keeping a sag out of the pipe line and also to prevent sharp bends. Also to keep the line out of water, which is frequently destructive to the line.

WRINKLE NO. 179

FLOAT REGULATING OIL TANK

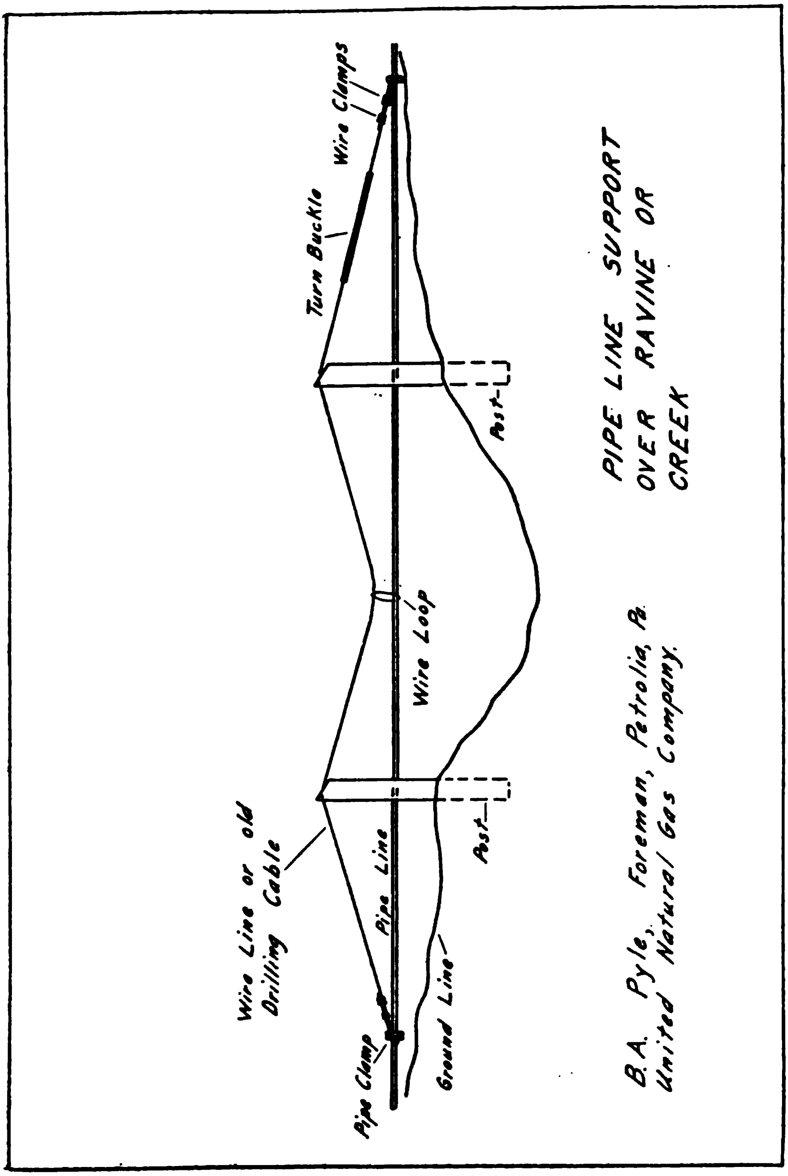
L. L. ZEIGLER, UNITED NATURAL GAS CO., QUEEN STATION, PA.

See the drawing giving details of the method used in the construction of this float regulating oil tank.



FLOAT REGULATING OIL TANK

Wrinkle No. 179



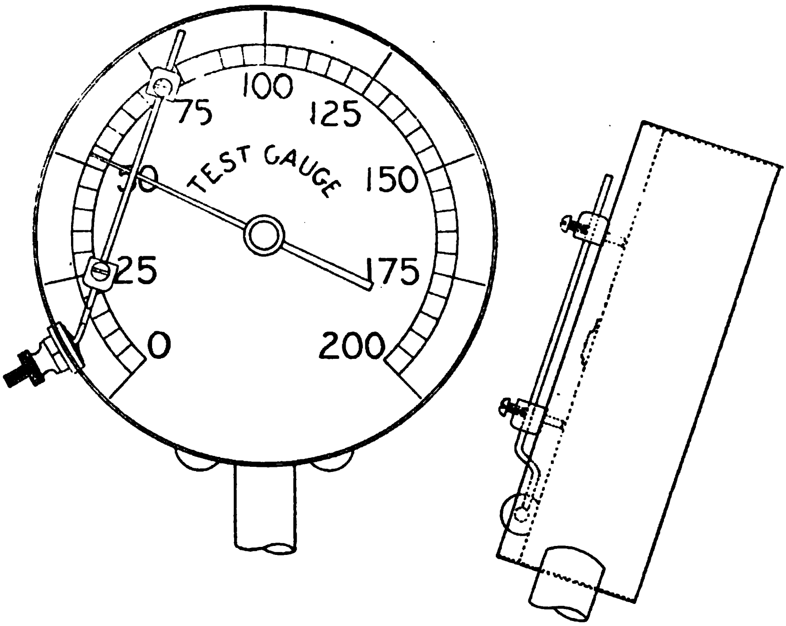
Wrinkle No. 178

WRINKLE NO. 180

ALARM ON GAUGE TO SHOW WHEN EXTREMES OF PRESSURE REACHED

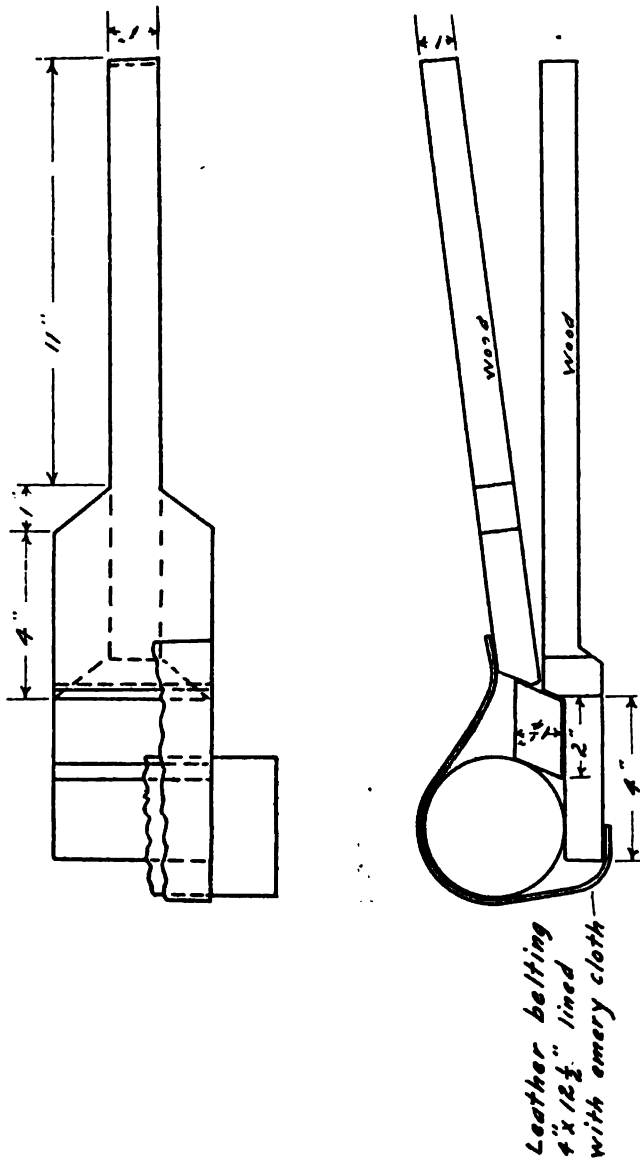
WM. M. ADAMS, CITIZENS' GAS & ELEC. CO., ELYRIA, OHIO

The drawing shows a method for constructing an adjustable electric alarm to give a notification that the pressure has reached either one of two extremes. A small steel rod has been attached to the side of the gauge. Upon this rod are two ad-



Wrinkle No. 180

justable slides which can be adjusted for any given pressure. By connecting one wire to the gauge and the other wire to the small steel rod, which is insulated from the gauge, we are able to form an electric current whenever the gauge hand touches either of the slides. When this connection is made, a small electric alarm rings, giving notice that an extreme pressure has been reached.



Wrinkle No. 181

WRINKLE NO. 181

DEVICE FOR CLEANING CAM SHAFT WHILE ENGINE IS RUNNING

W. W. MILLS, UNITED NATURAL GAS CO., MIOLA STATION, PA.

Everyone who is interested will readily understand the method used and illustrated in the accompanying drawing.

PRESIDENT OLIPHANT: Gentlemen, I would like to have a vote of thanks extended to Mr. Brown for his splendid work and in making that suggestion I want also to say at this time that the Wrinkle Department in pamphlet form can be obtained at the registration booth. They are available there for all who care for them. I would now like to have some member offer a motion to extend a vote of thanks.

MR. HARRY J. HOOVER: Mr. President, I think we have all watched the work of Mr. Brown in the Wrinkle Department for several years with admiration and respect. In a very modest way he has presented his report each year but his modesty does not cover up the fact that the Department as presented each year shows for itself that it represents a great deal of labor and effort on his part which the Association and its members appreciate. I think perhaps it is within the province of the Committee on Nominations already appointed to name a successor as Editor of the Wrinkle Department each year and as an expression of the rank and file of our membership I would like to include in the vote of thanks to Mr. Brown a recommendation to the Committee on Nominations that Mr. Brown be continued as Editor of the Wrinkle Department for the ensuing year.

I now move a hearty vote of thanks to Mr. Brown as Editor and to Mr. Sedberry as Assistant as a slight appreciation of the association for the good work performed by them and also I would include in that motion the recommendation as suggested.

PRESIDENT OLIPHANT: Gentlemen, do I hear a second to Mr. Hoover's motion?

MR. FRANK. L. CHASE: I take great pleasure in seconding Mr. Hoover's motion.

The above motion having been duly seconded was then carried unanimously amid applause.

PRESIDENT OLIPHANT: I wish to thank you personally, Mr. Brown, also. The next order of business is the report of the Committee on Conservation, of which Mr. J. B. Corrin is Chairman.

MR. J. B. CORRIN of Pittsburgh, Pennsylvania then presented the following:

REPORT OF THE CONSERVATION COMMITTEE

TO THE ANNUAL MEETING OF THE NATURAL GAS ASSOCIATION OF AMERICA, MAY 17-20, 1920.

J. B. CORRIN, *Chairman,*
A. J. DIESCHER,
J. C. MCDOWELL,
J. H. MAXON,
I. C. WHITE,
F. M. TOWL,
WM. B. WAY.
Committee.

To the President and Members of the Natural Gas Association of America:—

It is the opinion of your committee that the activities of the United States Government, through the Bureau of Mines, on the matter of natural gas conservation during the preceding year cover sufficient work along this line and a work in which all members of your committee have been actively engaged to make it almost imperative that the report of your committee shall contain particularly a synopsis of the activities of the National Committee on Natural Gas Conservation appointed by Secretary Lane, in January, 1920.

The Secretary of the Interior, Franklin K. Lane, addressed the following letter to some three hundred gas companies, municipalities, state officials, public utility commissions, etc., throughout the United States, calling a meeting in the City of Washington, for January 15th:

"The natural gas situation is acute. As there are over 2,400,000 domestic natural gas consumers, the national aspect is obvious. Domestic consumers waste more than 80% of the gas received. The efficiency of most domestic appliances can be trebled so as to make one foot of gas do the work of three.

To consider solutions of this problem, I have called a public conference of Governors, Public Utility Commissioners, Geologists of States, home economic experts, natural gas companies, owners and officials, and appliance manufacturers, in the Auditorium of the New Interior Building, at F and 18th Streets, Washington, D. C., at 11:00 o'clock, Thursday morning, January 15th. The purpose of this conference is to consider particularly, possible economics in gas utilization and the mutual interests of the public and the gas companies.

It is all-important that the public and the gas companies understand each other, and, I, therefore, urge the attendance of yourself and any others that you may wish to bring with you to this conference."

Excerpts from his address before the meeting on January 15th will be of interest. He said in part:

"Natural gas was one of these things found to be an essential. We have always known that it was a great resource; we have always been conscience-stricken because of our own wastefulness; and this conference has been called for the purpose of seeing if it was not possible by all coming together and talking frankly and freely to discover how this resource could be preserved, how it could be saved, how it could be made of greater usefulness to our country.

Before we have wasted these resourcs it is well that we should look around to find how they can be saved. I am not one of those who believe that a thing that has been given to us should be held in reserve for future generations. There is a true and false conservation. The false conservation is one that looks so far ahead that it does not allow the free development of the initiative and imagination and industry of the present generation. True conser-

vation is one which requires by the coercive conscience of the people themselves, who are in the industry, or who are dependent upon it, if possible the saving to the last minute particle of that resource, permitting its use, putting a premium upon use, but condemning every kind of use that does not make for the advantage of society . (Applause.) And your problem is to see how an irreplaceable resource can be best used.

As I have gone through the States where natural gas is, or has been aboundant, I have felt a sense of outrage at the manner in which it was burned all day and all night in the street lamps, wastefully used in industries as a fuel, wastefully used in stoves for cooking. I thmink we can honestly say to ourselves that we have not applied ordinary thrift, or good sense, to the method of burning natural gas.

Now, the upshot of a wasteful policy, whether it is in the field or whether it is in the house, or in the furnace of the industry — the natural and inevitable result — is that the strong hand of the law, of the community itself, will come down upon such industry. And I have thought it was the province of the government always to call attention to this possibility — to the condition that existed — and what government does it does by force. If we are not wise in time, if we are not appreciative of conditions that need to be remedied and are indifferent to them, sooner or later society, having learned of these conditions, will take to itself the right to be arbitrary; and society — at least in the United States — never does things half way.

The difficulty with any kind of governmental control is that it tends to standardize — it tends to lay down a certain definite fixed rule to which everybody, no matter what their conditions, must conform. And this kind of rigidity seems to be fundamental to governmental activity. All the experiments that have been made with government ownership or government operation confirm that statement. There is not an easiness; there is not a regard for individual conditions; we are unwilling to allow any governmental body the right to make an exception. If an exception is made it develops

trouble for the governmental body that makes it. And so, in self-protection, wherever the government acts it acts along a certain rigid standard, which is a thing those of common sense and of large experience know is not the thing that makes for fluency, for adaptability, for elasticity — and those things are vital to industry.

So I say to you gentlemen, the conference you are holding today between the public and the government and the producer — that conference is one that if successful, if carried on in the right spirit, may lead to the avoiding of infinitely greater troubles which may fall upon you and upon your industry. I do not know what a governmental policy might be with regard to natural gas. It might be that all industry would be denied the use of natural gas and home use alone allowed. You know how facts are gathered. It might be shown by a statistical study satisfactory to a board that that would be the wise thing to do and you know what would be the result upon your industry if such a policy were adopted. I do not say this to you with any desire whatever to intimate that this may come about; I am saying this to you because I have sympathy with the things that you have done, no little knowledge of what you have done, and a very great desire to see that this industry shall regard primarily and supremely the service that it gives."

Complete copies of the report of this Conference were mailed to the company members of this Association by your secretary, and the direct outcome of the conference was the adoption of the following resolution, introduced by Mr. J. C. McDowell, and seconded by Mr. A. Leo Weil:

WHEREAS, The supply of natural gas is limited in quantity and is not being replaced by nature, and

WHEREAS, There is no other fuel that can replace natural gas which is as cheap, as convenient and as efficient, and

WHEREAS, The supply of natural gas is failing in many communities:

Be it Resolved, In order that the supply of natural gas may be prolonged, and the service improved, this Confer-

ence recommends that the appropriate agency in each state which uses natural gas take measures to discover what amount of natural gas is now being wasted by the consumer, the various causes of such waste, and adopt such measures as may be available, to reduce such wastes and effect economics in order that the benefits from this natural resource be prolonged, and

Be it Further Resolved, That the appropriate agencies, both State and Federal, be urged to stimulate research in perfecting means and methods for a more efficient use of natural gas, and

Be it Further Resolved, That the appropriate State and Federal agencies be urged to conduct educational campaigns to instruct consumers and the public in the importance of the wastes of natural gas; how economics in the use of natural gas may be affected, and on the natural gas situation in general, that the public may be informed on the subject and deal with it in the most intelligent manner, and

Be it Further Resolved, That every effort be made towards arriving at understandings between the natural gas industry and the communities using natural gas as to how the supply of natural gas can be best conserved and its life prolonged, and

Be it Further Resolved, That a committee of ten (10) be appointed by the Chairman of this conference to represent the natural gas industry, and the public and Federal institutions, to cooperate with the Director of the Bureau of Mines in working out a constructive program for the conservation of natural gas and the bettering of natural gas service, and in collecting and distributing information on this subject."

and the appoinment of the following committee. This committee was composed of four men taken from the Natural gas Industry and six to represent the public and the Government and the four men on the committee representing the natural gas industry were suggested by the Board of Directors of this Association to the United States Bureau of Mines:

Van H. Manning, Director, Bureau of Mines, Chair. man.

John B. Corrin, The Reserve Gas Company, Pittsburgh, Pennsylvania.

L. B. Denning, The Ohio Fuel Company, Pittsburgh, Pennsylvania.

J. C. McDowell, Wichita Natural Gas Company, Pittsburg, Pennsylvania.

W. L. McCloy, The Philadelphia Company, Pittsburgh, Pennsylvania.

John S. Rilling, Public Service Commission of Pennsylvania, Harrisburg, Pennsylvania.

Miss Edna N. White, American Home Economics Association, Detroit, Mich.

Art L. Walker, Chairman, Corporation Committee, Oklahoma City, Oklahoma.

F. W. Wozencraft, Mayor, Dallas, Texas.

Samuel S. Wyer, Consulting Natural Gas Engineer, Columbus, Ohio.

Dr. I. C. White, State Geologist of West Virginia, Morgantown, West Virginia.

The next meeting was held in Washington, February 23rd, 1920, at which time a number of suggestions pertaining to the conservation of natural gas were submitted by the different members of the Committee and the outcome of that meeting was the dividing of the work along three different lines — 1st, Production; 2nd, Transmission; 3rd, Utilization; and three different committees were appointed by the committee themselves to take up the conservation problems along the lines assigned to each separate sub-committee.

The sub-committee on PRODUCTION was composed as follows:

W. L. McCloy, Chairman,
John B. Corrin,
Dr. I. C. White,
Art L. Walker.

The sub-committee on TTANSMISSION composed as follows:

L. B. Denning, Chairman,
F. W. Wozencraft,
S. S. Wyer.

The sub-committee on UTILIZATION composed as follows:

J. C. McDowell, Chairman,
John S. Rilling,
S. S. Wyer,
Miss Edna White.

The committee met again March 27th in Washington, to hear the reports of the different sub-committees which were as follows:

REPORT OF SUB-COMMITTEE ON PRODUCTION PROBLEMS

To the National Gas Conservation Committee:

"Your sub-committee appointed to consider "Production Problems" has, in accordance with the spirit which characterized the general conference of January 15th, and February 23rd, 1920, taken up its work and has endeavored to the best of its ability to secure detailed and accurate information from the most reliable sources in all parts of the United States on the following phases of "Production Problems":

1. Efficient Production Methods (this includes the subject of use of gas in field operations.
2. Spacing of Wells.
3. Enrichment of Artificial Gas with Natural Gas.
4. Prevention of waste of gas where there are no facilities for marketing it.
5. Elimination of open or flambeau lights; and
6. Cooperation of the interests controlling the supply of natural gas.

Your sub-committee has been delighted with the wide-spread interest that there is in the subject of national natural gas conservation. There has been an almost spontaneous manifestation of interest in all matters which will ultimately result in actual conservation. Leading men from all of the American gas

and oil fields, representatives of natural gas producing and natural gas distributing companies, have been willing and ready to contribute to your committee's information from their vast experience and knowledge of the natural gas industry. Without exception, all recognize the acuteness of the situation and express the hope that something of a very highly constructive nature can soon be done to insure a continuance, for the longest possible period of time, of the already waning supply of natural gas. In order that the results of the investigations of your subcommittee may be presented to you as briefly as possible and at the same time keeping in mind the purposes to be served and the end to be attained, a summary has been prepared. This summary, your committee believes, is the real summation of all of the best thought and experience of the men in the natural gas industry.

In the past, much has been said and written regarding the enormous waste of natural gas. All persons who have had practical experience in, and all those who have studied about the natural gas industry are fully acquainted with the source of loss and waste. It is therefore not necessary to restate at this time the facts and conditions connected with these large losses of natural gas. It is only necessary to admit that great losses have occurred and utilize the mistakes of the past as constructive means for future conservation of one of our greatest national resources. Individuals, corporations, and the government have all been parties to this depletion of the natural gas supply. One of the principal sources of waste of natural gas in every gas field of the country from New York and Pennsylvania to Texas and California is that connected with the opening up of new oil fields where the same are accompanied by large flows of natural gas, sometimes from gas producing sands above the oil producing horizon and most often and most conspicuously from the oil horizon itself. Oil has always been treated as a more valuable product than natural gas and in order to get oil production, the gas been permitted to blow into the air. If the gas which has been wasted as a result of efforts to increase oil production could be made to cover the trees and ground and could be seen like a waste of oil, the magnitude of the waste would be such that

the public would be more startled than it has been by reading what has been said and written regarding these enormous wastes. No true conservation can be accomplished unless the value of natural gas is considered high enough to make it worth conserving. Gas has been wasted today because it is cheap. This is not only true in its use by the domestic consumer and industrial consumer, but it is true in its use in the field by the producers and, even to some extent, by the larger operating companies. Even Coal Companies operating in fields where gas is produced find gas in many instances cheaper to use than coal at the mine. The public is as responsible as the producer for this loss as the public has not been willing to pay what the gas is worth and thereby justify the investment of capital in the marketing of it. Legislative enactment could have been of no avail in that the public could not have been compelled to purchase a commodity which it did not desire, neither could capital have been compelled to make an investment which would not yield a reasonable earning. Legislative enactment, affecting the producer, would have resulted in the throttling of an industry which, as present conditions attest, has had more to do with our commercial development at home and American commercial supremacy, both in times of peace and war, than any other industry for which our country is noted. The development of our present oil and natural gas industries has been an organic one. These industries have evolved under normal and natural conditions and any arbitrary conditions imposed upon them would have been destructive rather than constructive. These industries have always readily adapted themselves to changes of conditions and only the good practices of the past have survived in the activities of the present. The growth of these industries has been in the past, and will be in the future, *from within, out.* Any other kind of growth would be unnatural and lack both quality and permanancy. The future status of these industries will be determined by taking the best of the experience and thought of the men who have spent their lives in the industry and permitting this to develop under conditions imposed by the universal law of supply and demand. No other factors will have a constructive bearing upon the conservation of our natural gas resources. The

National Natural Gas Conservation Committee and its sub-committees can do much, along the lines of conservation in devising ways and means and in an advisory capacity, to eliminate the wrong and wasteful and substitute therefor the economic. Your sub-committee can assure you that there are very few, if any, operators, or operating companies, which do not wish to conserve natural gas where it is in the least profitable to conserve and sell their surplus for use of the public. The waste almost invariably occurs where it costs the operator more to conserve than he can get in return for his gas. Any work of education by the Bureau of Mines, whereby the operator is shown how the wasted gas can be utilized at a profit will prove the quickest and most effective means for conservation. If the ultimate consumer is to be benefitted in the conservation of gas in the field, the consumer should pay a rate that will in turn justify a rate for the gas in the field which will make it profitable to the operator or operating companies to make the expenditures necessary for conservation.

1. Efficient Production Methods (including the subject of Use of gas for field operations.)

The gas producing well is the foundation of the natural gas industry and if our supply of natural gas is to be conserved, conservation measures must begin with the drilling of the gas well. The field sources of waste of natural gas are directly connected with the drilling, bringing in, and the life of the gas well.

(a) Losses due to the employment of inexperienced drillers.
(b) Losses due to improper casing and tubing.
(c) Losses due to insufficient and improperly placed packers.
(d) Losses due to inadequate and ineffective cementing.
(e) Losses due to failure or neglect in mudding off water and shallow gas strata.
(f) Losses due to inefficient use of gas as a source of power and light in drilling operations.
(g) Losses due to overproduction of gas.

(h) Losses due to open flow and rock pressure measurements.
(i) Losses due to blowing off wells to remove water, or failure to supply well with syphon for this purpose.
(j) Losses of gas to increase oil production.
(k) Losses due to entire lack of, or improper installation of oil and gas separators.
(l) Losses due to improper or entire lack of plugging of exhausted wells or dry holes.
(m) Losses due to abandonment of low rock pressure, small volume producing, wells.
(n) Losses due to inexperienced drillers, improper casing, etc.

All of the above sources of loss of natural gas have, in the past, been of much concern to the large natural gas producing interests. Corrective measures have been applied and are continuing to be applied to prevent all of these losses. The wildcatter, the small producer, and the uninformed promoter have been most indiscriminate and guilty with reference to the waste of natural gas. It is a common occurrence to read in the newspapers of a gas or oil company, largely composed of men totally unacquainted with the oil or gas business, bringing in a large oil or gas well and the same has gotten out of their control and either the oil or gas, or both, was going to waste. Days and days have elapsed before experienced men are employed to shut in the well and stop the waste. In practically all of these cases, the situation is directly traceable to the employment of inexperienced men and little or no provisions for the proper casing of the well and the care of the product obtained. It requires no argument to prove the statement that only experienced men should be employed in the drilling and shutting in of a well and that there should be ample provisions made for casing, tubing, packing, cementing, and other necessary appliances, so that the well, as soon as it is brought in, can be closed in promptly or else the product can be delivered to places where it can be utilized. The proper casing of wells, together with "mudding up" of sand

productive of gas, thus protecting the gas producing sand from waters or the dissipation of gas into other sand measures, is a work for conservation. The condition governing the casing of wells in various fields in the country are so different, no general suggestions would fit all cases. Educational work by the Bureau of Mines in the various gas fields added to the idea of making it profitable to the operator to conserve and market the gas will bring results beyond expectation. The Bureau of Mines should give additional demonstration of the "Mud-Laden Process", especially in the eastern fields. The value of this scheme is not generally appreciated in the east. Its use in many cases will prove a practical help. The "mudding off" process has been developed by the Bureau of Mines and effectively utilized in the Oklahoma, Kansas, and all of the southwestern oil and gas fields. The "mudding off" process insures oil and gas pools from dissipation through water invasion on account of defective casing or other causes. Encouragement should be given operators and producing companies to have them produce gas when found in marketable quantities in the more shallow sands before drilling deeper, rather than to case it off and produce gas through Braden head for the well known reason that proper care from water cannot be given back of casing, as in the open hole, unless the case off gas can be continuously marketed. The expense of moving in for second drilling is one of the reasons for casing off gas in marketable quantities, and attempting to produce through Braden-head. If the operator is compelled to drill on to the lower sands for the proper protection of his property, he should "mud off" such gas in upper sands upon first indication of water affecting same, or if no market is at the time available.

Losses Due To Inefficient Use of Gas in Field Operation

Practically all of the drilling operations prior to 1915 were carried on with field steam boilers as the source of power. These boilers were uncovered and unhoused and the steam lines uninsulated. The gas consuming appliances were not installed with the idea of efficient consumption of gas. The gas used was for the most part unmetered and was sold at a ridiculously low flat rate daily. It is conservatively estimated that the average

daily consumption of one field steam boiler is 50,000 cubic feet of gas. The source of light around the drilling rig was the open or flambeau torch. It is needless to say that this loss of gas was wasteful. Recently it has been demonstrated that gas engines wherein natural gas may be most economically utilized as fuel can be used as a source of power in drilling operations and for driving a generator to produce electric light and thus provide a safer and superior kind of illumination. Actual measurements show that a gas engine ample for all purposes can be very satisfactorily operated with a daily consumption of natural gas of only 7,000 cubic feet. If 7,000 cubic feet of natural gas per day are now used in the ordinary oil country boilers, the saving would at once appeal to the operators, if he has a market for the gas saved at a rate making it profitable for him to make the capital investment. Where oil country boilers must be used to furnish steam for drilling, cleaning out, pumping and like operations, they should be protected with covering to prevent radiation. A saving of 30% in gas will be the result. All boilers using gas should have at least twelve feet of stack. It is clear what the remedy for this source of loss is — the elimination, as far as it is possible, of the steam boiler and the substitution therefor of a gas engine for those operations to which it is adaptable; the elimination of the dangerous and unsatisfactory open or flambeau torch and the substitution therefor of the generator and the electric light; and the elimination of the flat rate service, and the substitution therefor of a meter service at a price commensurate with the cost of a substitute fuel. All these changes can and will be readily made by the industry within itself. Many large producing companies have already inaugurated these reforms in drilling practice and all others will do so when the public makes the natural gas worth saving. By the universal adoption of these changes in drilling, gas will, as one of our most well informed men writes — "be saved at the spigot, while our forefathers lost at the bunghole."

Losses Due to Overproduction

When new fields are discovered, as a rule the rock pressure is sufficient to send the gas to market. If the well is properly

handled with reference to the supply of gas it can deliver daily most advantageously, there is an assurance that the supply from the well will continue over the longest period of time, but in many fields if the well is drawn on to such an extent that there is an overproduction, the gas sands are soon invaded by water the supply short lived. Under proper conditions of production the natural rock pressures gradually decline and in order that the gas may be made to flow freely from the wells, compressing stations must be installed to provide artificial power necessary to deliver from the well an amount of gas not resulting in overproduction. Judicious installation and operation of compressing stations is one factor which will contribute to the longest possible life of any gas field, all other factors being equal.

Losses Due to Open Flow Measurements

Open flow measurements are taken from time to time by many of the gas producing companies to determine the available amount of gas ready for service. When a well first comes in, it is useful to know what the open flow measurement of the well is, but it serves no useful purposes at any other time and should be discouraged. If this measurement is taken according to the ordinary instructions covering such measurements, enormous wastes of gas are entailed. A device consisting of a back pressure regulator designed to take the feeding flow of wells against line pressure has been invented. If this device is properly installed and the results are properly interpreted, it is possible to determine, within a very small per cent, the exact amount of gas available at any line pressure. The remedy for the waste of open flow measurements was supplied by a natural gas company and this remedy, like all others heretofore mentioned, has grown out of the best experience and thought of the men in the industry. In the interest of conservation, this corrective measure should be welcomed and immediately put into practical use by all of our American natural gas companies.

Losses Due to Blowing Off of Wells and Drips

Gas wells invariably at some time in their life are invaded to a greater or less extent by water. It has been the practice in the

past in order that the water may be removed from the well to shut in the well until such time as a maximum rock pressure had gathered and then open the well wide and permit the gas to flow through a three-inch, four-inch, or six and one-quarter inch tubing, trying to exhaust the water. This practice was never successful but it always did result in losses of a big percentage of the gas. Line drips were installed for the collection of water so that water coming from the wells and going into the lines could be effectively removed. The blowing off of main line drips was always wasteful, not only of gas, but of the investment required in making the installation. The Bureau of Mines, acting in cooperation with the gas producers of the Mid-Continent field, has perfected a syphon line in the well so that the water can be removed with no loss of pressure and no interruption of gas service and with practically no loss of gas. The results are well known to men conversant with the natural gas industry. Small pumping outfits are readily procurable for this same purpose. The corrective measures for the elimination of this source of waste are available and can be generally applied. The adoption of either of these methods of eliminating water from a producing gas well and from main lines will go far toward conservation of our natural gas supply.

Losses of Gas to Increase Oil Production, Etc.

A great and conspicuous waste of gas, however, and this applies to every portion of our vast oil domain, is where both oil and gas occur in the same producing horizon. Most newly developed oil pools contain a large amount of natural gas either immediately over the saturated oil zone or dissolved in the oil itself under pressure, and it is this vast waste of gas, always rich in gasoline content, the oil producer made little or no attempt to separate from the oil. The oil producer, generally, up to seven years ago, regarded this gas as an intolerable nuisance. As the demand for the lighter or more volatile distillates of crude petroleum oil increased, due to the extensive use of internal combustion engines, it became worth while to save this gas and recover from it natural gas gasoline. The public wanted and needed gasoline and was willing to make natural gas worth

saving. The conditions imposed upon the oil and gas industry by the universal law of supply and demand were recognized and the practices within the industry were changed by the men in the industry to meet these. That which was formerly wasted as of no value was saved to the profit of both the producer and the consumer. Oil and gas separators were designed, installed and efficiently operated. The industry was in advance in its preparation for this form of conservation, for the problem had been completely solved ten years ago in Mexico by Mr. Herbert G. Wylie, General Manager of the Huasteca Petroleum Company, when one of the greatest oil wells of the world, and the pioneer oil well of Mexico, the famous Casiano No. 7, was completed and began its spectacular career of flowing twenty odd thousand barrels of oil along with from eight to ten million cubic feet of gas every day of the year until the middle of 1919 when it had put into storage nearly eighty millions barrels of oil and gas had been supplied and sent through an eight-inch pipe line seventy-five miles to Tampico under its own pressure to provide fuel gas for four intermediate oil pumping stations and the extensive terminals at Tampico, etc. Appended, to this report, is a photographic reprint of the oil and gas separator. There is, therefore, no valid reason why the same thing cannot be done at every well in America. Gasoline extraction plants can be erected for handling small quantities of gas, if it can be made a profitable undertaking, and by this means, not only conservation in gas production would be affected, but an added production of gasoline would result.

Losses Due to Abondoment of Small or Exhausted Wells

In many gas fields of the United States where there is developed territory, it has been the custom of abandoning low pressure, small volume, or exhausted wells, and thus avoid the necessity of installing compressing stations to effectively take from the sand all of the available supply contained therein. Tests have been made and estimates calculated which seem to indicate that in wells of this type, which have been abandoned, that the percentage of the gas thus left in the sand forms a considerable proportion of the original available supply in the well. The

gas left in the sand of such abandoned wells is, of course, wasted.

The greatest danger to such a proceeding is one of invasion of the gas bearing sand by the migration into it of water. This practice is mostly indulged in in the newer gas fields. In the old fields, wells of sufficient volume are pumped and the gas saved by carrying a pressure less than atmosphere on the gas producing sands and all of the possible gas thus removed and utilized. In all gas fields, the gas should command such a price from the public that the gas producing company would find it worth while to make the investment required to secure this gas and defray the expense of delivering it from the sand to the consumer.

One of our most experienced, as well as most widely known natural gas producers and one who is a real conservationist, is enthusiastic for the invention of a cheap and efficient small gas compressor wherein gas or electricity are utilizable as sources of power and for the installation of these at the most advantageous points so that natural gas may be delivered from old small volume low pressure wells itno the suction lines of the larger compressing or boosting stations. He is of the opinion that these installations can be made and operated with as little expense as oil pumps today are operated for the delivery of oil from the small oil producing wells. There is no question about the merits of this proposition and your sub-committee believes that such an invention would most materially aid in removing all of the available natural gas from the sand. This phase of conservation will evolve from the industry as economic conditions warrant, and it is suggested that it might be a function of this committee to aid in bringing about this condition. The expense of cleaning up old field of the remaining natural gas is a matter for serious consideration. The value of the remaining gas is the controlling factor when the question of allowing to remain in service the enormous investment in pipe lines, built to carry large volumes of gas in days when fields were more largely productive, is considered.

The difficult problems of assembling at a profit the small volume of gas produced in oil fields where it would not be prac-

ticable to save and market the gas from any one lease, or group of wells, might be accomplished by the formation of a gas gathering company; such a company might be formed by a number of oil producers joining together for the purpose and raising the capital required, to gather the excess gas from all their wells, for the purpose of transporting the same for sale to the nearest utility.

Spacing of Wells

The history of the natural gas industry contains many instances of the early depletion of the natural gas supply in various parts of the United States where improper spacing of wells was one of the most important factors contributing to this result. A recent instance of the improper spacing of wells is that of the Mckeesport field. The McKesport territory, like many other gas bearing territories, has been over drilled. There has been no attempt to proportion the number of wells to any definite amount of land. Such practice has been and always will be prolific of waste. Any restrictions by law, legislation, or commission, would be most harmful to the oil industry and the development of new resources of oil and gas and it is recommended that the work of the committee be limited to an effort to educate the operators against over-drilling developed areas. There can be no doubt but that many of the existing fields can be protected and the life of these prolonged if the natural gas companies would not crowd lines. Your sub-committee thinks it highly probable that through the Natural Gas Association of America this and other conservation matters can be so forcefully presented to the indiustry that there will be a happy and ready responses to constructive suggestions. This is a natural method of remedying the evil of improper spacing of wells.

Enrichment of Artificial Gas With Natural Gas

The question of enriching artificial gas with natural gas is one which is of interest to all producers of natural gas and to about two and one-half millions of domestic consumers in approximately two thousand towns and cities in the United States. These two thousand towns and cities represent more than fifty

per cent of all the cities in which any kind of fuel or illuminating gas is utilized by the public. Geographically, this subject is of interest particularly to the people of the States of West Virginia, Oklahoma, Pennsylvania, Ohio, New York, Indiana, Kansas, Louisiana, Texas, California, Wyoming and Kentucky. The interest, therefore, is very wide. It is the desire of all good citizens that each and every kind of natural resource be conserved so that these natural resources may do the greatest good to the largest number over the longest period of time.

It is true that in the past there have been many sources of waste of natural gas — waste of production, transportation, distribution, and use. In order to secure markets for the large volume of natural gas at one time available, large industrial concerns have been encouraged to use natural gas as a fuel at prices far below the cost of any substitute fuel — oil, coal, coke, or wood. The domestic use of natural gas has been encouraged without any requirements on the part of the public as to the efficiency of the devices in which natural was was to be used. All of these practices have resulted in a depletion of the supply, and a movement has arisen for conservation of the natural gas supply. Many suggestions have been made and many theories presented regarding the methods of procedure which will result in this conservation. Practically all agree that the only way in which the use may be restricted and the supply conserved is by higher rates, with which change there should be a revision of consumer's appliances to give the consumer the maximum benefit with the restricted volume. The proposal to restrict the use of natural gas entirely to domestic consumption, excluding all industrial uses, does not solve the problems of the domestic house heating load in winter, as there is an insufficient supply for that purpose with all industrial gas curtailed. The public should be informed that sufficient gas is no longer available for adequate house heating, except in a few places. The peak load created by the house heating load at times of low pressure cannot longer be supplied and other arrangements should be made for house heating. It has been suggested and experiments have been tried of augmenting the natural gas supply with an artificial or manufactured gas. Many of the suggestions and experiments have

proven impractical for these did not take into consideration the unexplored region of high compression and high temperatures resulting therefrom, transmission thru transportation lines, over long distances, and distribution to a gas consuming public, accustomed to a clean uniform gas. There is little that can be done by producers and distributors of natural gas which will conserve the natural gas supply unless the public is disposed to adopt co-operating and conserving measures. The concerted action of the two interested parties — the producer and the consumer — will achieve results desired.

Enrichment of artificial gas with natural gas seems to imply the idea that the basis of the public fuel gas supply will be a manufactured gas and only such quantities of natural gas will be added to this basic manufactured supply as conditions warrant and permit. Atmospheric conditions will be the barometer of the public demand. The requirements for gas will be greater in the cold months than in the warm months. An artificial gas plant cannot be equipped and maintained so that it will be flexible enough in operation to meet the varying demands of a public accustomed to the use of natural gas without the investment of excessive sums of money. A plant large enough to meet all requirements could be maintained and operated only with great financial losses. Capital could not be interested in such a proposition. The extent of the enrichment of the artificial supply with the natural supply will, to a greater or less extent, be determined by economic conditions governing the installation, maintenance, and operation of the artificial gas producing plant. Those who are responsible for the manufacture of gas are entitled to a just and reasonable return from their investment. Those who are responsible for the exploration, development, production, transportation and delivery of natural gas to a distributing system where artificial gas may be enriched with natural gas must have a satisfactory return, not only for the investment, but also for the hazard of the undertaking. Natural gas is in every respect a safer, cleaner and better fuel than any manufactured gas and per se should economically command a better price. Large sums of money have been invested in leasing, purchasing, drilling, the building of compressing stations, pipe lines, etc., in order to give

the public a gas, although of natural origin, yet of the most superior quality. The natural supply is a fixed quantity and the total of it becomes less and less as time goes on. The supply cannot be replenished.

There are in nature three potential sources of raw material adequate for the production of a future domestic supply of manufactured gas which may be enriched with natural gas. These three potential sources are: crude oil, bituminous shale, and coal.

The following cities in our Western States are at present supplied with manufactured gas from oil — Portland, Oregon; San Francisco, California; San Diego, California; Tacoma, Washington, and Oakland, California. All of this gas has a heating value in excess of five hundred and fifty B. T. U. It is a well known fact that the supply of crude oil is at present not equal to the demand for it. The demands are constantly increasing and the sources of production are constantly decreasing and unless new and unexpected oil fields are developed, crude oil will be so expensive that it will not be possible for a manufacturer of gas to utilize it as the raw material from which his supply is to be derived. Economic conditions, therefore, practically exclude oil as the raw material from which the future supply of manufactured gas is to be derived.

Shale gas has been made and utilized with some degree of efficiency in Scotland. Considerable experimental work has been done in the United States looking toward the development and utilization of the vast beds of bituminous shale in some of our western and southern states. The geographical location of bituminous shale beds is such that with our present lack of engineering and technical knowledge regarding the use of bituminous shale as a future source of adequate supply of manufactured gas, that any statements regarding this use of shale only would be suggestive and not constructive.

Producer gas, water gas, carburetted water gas and coal or coke oven gas have all been made and used with greater or less success for many years past. Of all the natural sources for an adequate supply of manufactured gas, coal seems to be the only raw material which is at present feasible for use for such purposes. Upon the basis of these remarks, coal is to be regarded

as the one raw material from which our supply of manufactured gas is to be obtained.

Producer gas has been successfully made and utilized in an unclean and heated condition as an industrial gas. The conversion of coal into producer gas and the use of producer gas, unclean and at the temperature at which it is produced, with an ammonia recovery and tar utilization, is probably the most efficient and conservative use of coal as a source of *industrial* gas. It has not been fully demonstrated that producer gas can be cleaned to such a degree as to render it suitable for domestic use.

The manufacture of water gas consists of an intermittent process wherein a bed of coke is heated to a high temperature and rendered incandescsent by blasts of air and then superheated steam is passed through the incandescent fuel bed. The coke and steam interact chemically to produce carbon dioxide, depending upon the temperature maintained in the fuel bed. Water gas, thus manufactured, has practically no candle power and a heat value of about 325 B. T. U. and the yield is about 45,000 cubic feet per ton of coke. Water gas is easily cleaned. On account of the substances entering into the composition of water gas, this gas is practically odorless. In order to make water gas saleable and utilizable by the public, it has been found necessary for the manufacturer of it to carburet it so as to add to it other ingredients which will raise its candle power, its heating value and give it an odor. One factor which discriminates against water gas to carburetted water gas as the basic supply is that the method of manufacture only provides for the use of the coke, one of the by-products, in the distillation of coal and therefore, the method cannot be the most conservatory of natural resources when only one of the many by-products of the raw material, coal, is utilized for the production of gas. The carbureting of water gas so as to give it high heating value and illuminating quality requires the use of gas oil, a distillate from crude petroleum. This use of waning supply of petroleum distillates is far from conservation and in addition, is expensive. In order to carburet water gas so that it will have a candlepower of eighteen and a heat value of 570 B. T. U., it is necessary to use three gallons of gas oil per M. cubic feet of gas. 108 cubic feet of natural gas

(1100 B. T. U.) are equal to one gallon of gas oil enrichment value. This use of natural gas justifies a price of 75c per M. cubic feet, when gas oil is selling at 7¾c per gallon. This value of natural gas, created for it by market conditions of gas oil, does not include the item of expense which the manufacturer of water gas must add to his cost of production, namely, the fuel required to maintain a temperature sufficient to convert the gas oil into fixed gases to be added to water gas to raise its heating value. It is conclusive that the artificial gas enriched with natural gas will be of greater economic value to the public than any purely artificial supply.

Prevention of Waste of Gas Where There Are No Facilties Available to Market It

When large supplies of natural gas have been developed and there are no facilities installed or available for utilizing or marketing the gas, the gas under no circumstances should be permitted to go to waste.

The wells should be shut in and all precautions taken to prevent escape and waste of gas until such time as conditions warrant the delivery of the gas from the earth. If the gas has been developed in regions near available markets, proper lines should be constructed and utilized for the delivery of the gas to natural gas gasoline recovery plants and from these to consumer's lines to market. If the gas is developed in a region far distant from marketing facilities, the one use to which the gas can be put is in the commercial undertaking of natural gas gasoline recovery and carbon black manufacture. The owner of the well is entitled to a return on his investment and he should be permitted under the conditions to utilize his gas in the most profitable and generally beneficent way. Gasoline and carbon black are commodities for which there is a considerable and increasing demand by the public, and if there are no opportunities which the domestic consumption of natural gas as sources of light and heating power offer, then the utilization of it for gasoline recovery and carbon black manufacture is the highest form of conservation possible. Carbon black manufacture, if carried on, utilizing natural gas where gas consumed could be put into

the utility lines, is far from conservation. It is wasteful practice but economic conditions have been such that the public has not made it worth while for the Gas Companies to purchase the gas utilized for carbon black manufacture so that it could be delivered for domestic consumption. The manufacturer of carbon black has been able to get more for his gas, even though all the heat resulting from the incomplete combustion has been lost, than he has been able to derive from its sale. Experiments have been in progress for a number of years looking to the development of a method of manufacturing carbon black much more economically than by the method at present employed. It is to be hoped that the development of this process will show that largely increased yields of carbon black per thousand cubic feet of natural gas treated can be obtained and that other by-products such as industrial alcohol, may be manufactured from the waste gases in connection with the process. If this can be realized, it will mark a new era along natural gas conservation lines where the natural gas supplly has been developed in regions remote from available domestic markets.

Elimination of Open or Flambeau Lights

Your sub-committee is pleased to report that there is unanimous approval of the proposition to eliminate or abolish the open or flambeau lights. There is nó defense or argument in favor of the continuance of this wasteful use of natural gas.

Cooperation With the Interests Controlling the Supply of Natural Gas

If the labors of the National Natural Gas Conservation Committee and its sub-committees are to result in an actual conservation of our natural gas supply, it is absolutely necessary that there shall be the heartiest cooperation between the producer and the public. Conservation must begin with the gas in the original strata and must end with the public. The Government can do much in an advisory capacity along educational lines, instructive alike to producer and consumer. The Natural Gas industry exists because of the public and were there no demands for natural gas there would be no occasion for a natural gas

industry. The commanding position which American industry holds in the world is due to the fact that the American Institutions are such that the individuality of human enterprise has been preserved and safeguarded under all conditions.

Immense sums of money have been expended and invested by individuals and private corporations for the development of the sources of national natural gas supply and the creation of markets for its utilization. Whatever is the position of the American Natural Gas Industry today, it is the result of private enterprise of oil and natural gas producing companies. The work of these two classes of industries are so closely allied that it is impossible to separate the achievements of one from the other. The needs of the country for oil and its by-products is fully as great, if not greater than for natural gas. Therefore, nothing in the conservation programme should be done to handicap the production of oil unless offsetting benefits are sufficient to justify such action. The natural gas producer, whether he be styled oil or gas operator, aside from the economics to be derived will take it as a point of honor to prevent all possible waste of natural gas.

The public can stimulate a programme of natural gas conservation by informing itself of the most economic means of securing light, heat and power, and by providing itself with the most efficient appliances for use of the commodities available for these purposes. It is an old saying that "Necessity is the mother of invention," so here the necessity of aiding in such a conservation of our national natural gas resources as is possible is an incentive for the public to secure the information which it needs for a rational cooperation in the solution of the natural gas problem. The Government, through its various Educational and Technical Bureaus, can do much in the dissemination of literature regarding the most efficient appliances and methods for utilization of natural gas by the domestic consumer, so that, as a result of education, the greatest good will come to the largest number over the longest period of time.

Waning supply of natural gas and increased cost of production together with largely increased demand for the more extensive use of gas are the economic factors which necessitate con-

servation. The producer must secure the supply in the most efficient manner by the use in the field of the most approved appliances and under the least loss conditions. Waste must be eliminated. The public must restrict usage of gas by the installation of the most economical appliances for its consumption; make adequate provision for taking care of the house heating load of winter with a substitute fuel and be willing to pay a price for the gas commensurate with the service rendered and the convenience afforded, and the superior quality of the commodity provided. This sub-committee has not hesitated to declare that conservation depends upon higher rates as the most potent factor to conserve gas for the best present and future use; in so doing we are not thinking of profits or increased profits; a fair return under the rules of the States Commissions which control rates in almost every state where natural gas is marketed is all that a company is entitled to, in its enterprise of public service. We have urged the necessity of higher rates strictly as a Conserving influence to secure improved and prolonged service of a failing commodity. In addition to the elimination of losses and wastes and in the improvement in the production methods, we believe higher rates will make it possible to pay more for gas in the fields and thereby secure the utilization of gas not now marketed and the stimulation of the production of new gas.

W. L. McCloy, *Chairman*,
J. B. Corrin,
Dr. I. C. White,
Art. L. Walker,
Sub-Committee on Production.

RECOMMENDATIONS OF TRANSMISSION SUB-COMMITTEE

Measuring Devices for Natural Gas Necessary to Cope with Gas Leakage Situation

Resolved, That in the interest of conservation, whenever possible and expedient, all natural gas should be measured either at individual wells or groups of wells where it is produced in the

field and before it begins its journey to ultimate consumer; that all consumers using gas from transmission lines have their supply measured; and that all gas for operating compressors or other uses be measured; that all gas out of main lines into distributing plants be measured; and that no rate increases be granted by Public Authorities to gas companies that have not started the installation of a comprehensive gas measuring program.

Percentage Contracts for Retailing Natural Gas Should Be Against Public Policy

Resolved, That it is our belief that percentage contracts for selling natural gas through distributing plants on the basis of a certain percentage of the income from ultimate consumer's meters, without any limitation whatsoever as to the leakage conditions of the local distributing company's plant through which the gas is marketed, that such contracts ought to be declared against public policy, because they stimulate waste, and they should be avoided in the interest of the public good.

More Intensive and Extensive Use of Natural Gas Compressors

Resolved, That in the interest of the most efficient utilization it will be desirable to lower the intake pressures on many gas compressing stations now in operation, and in future additions to have smaller units as close to the wells as operating conditions will permit and that the State Public Utility Commissions make such provision and regulation as will stimulate the further removal of the underground residue supplies of natural gas.

Gas Distributing Pressure Should Be Recorded in Inches of Water Instead of Ounces Per Square Inch

Resolved, That in all natural gas pressure distribution regulation, whether state or municipal, the pressure be referred to in inches of water rather than ounces per square inch, and that all natural gas companies record and report their distributing pressures only in inches of water.

Desirability of Gasoline Removal

Resolved, That in the interests of good conservation and good service — wherever expedient — all gasoline that can be commercially separated from natural gas shall be so separated before the gas is started for market.

Inadequate House Piping

Resolved, That the attention of the State Authorities be called to the necessity of having adequate service lines and adequate house piping if satisfactory gas service is to be obtained, and we recommend that all such state authorities follow the general recommendations laid down by the Bureau of Standards, in its report now in preparation on "Standards for Gas Service".

Electrolysis Damages to Pipes

Resolved, That the attention of the State Authorities be called to the necessity, from a public interest, of establishing and enforcing regulations to reduce and limit, and whenever possible prevent the carrying of stray electric currents that have leaked off of the grounded return of single trolley electric railways and then onto underground gas transmission systems, because where such stray electric currents shunt around joints on the gas pipes or leave the gas pipes to go back into the soil, they must always remove a part of the metal, and thereby produce what is known as electrolysis, which is a disintregration of the pipe that will ultimately produce a hole, and thereby increase the leakage, as well as life and property hazard.

Suction Fans or Vacuum Pumps on Consumer's Lines Should be Prohibited

Resolved, That the use of suction fans or vacuum pumps on the service lines or house piping on consumer's premises to draw or suck gas out of the distributing system should be prohibited, because they enable such consumers to take an unfair and unwarranted advantage of other consumers, and at the same time they stimulate wasteful use of natural gas. We recommend that State Utility Commissions issue orders providing that all

consumers that use suction fans or vacuum pumps will have their service entirely discontinued.

L. B. DENNING, *Chairman*,
S. S. WYER,
MAYOR F. W. WOZENCRAFT,
Transmission Sub-Committee.

RECOMMENDATIONS OF UTILIZATION SUB-COMMITTEE

Restriction of Industrial Gas Sales

Resolved, That the State Utility Commissions of each State in which natural gas is used request every natural gas company in their respective states to submit to them a report on or before July 1st, 1920, indicating the extent to which natural gas is supplied for industrial as well as for domestic purposes; stating in detail what re-arrangements in operating conditions would be necessary or desirable to enable the companies to conserve their supply of natural gas for domestic use.

Manufactured Gas Stoves

Resolved, That where manufactured gas stoves are available for natural gas that they be used, since by proper adjustment a much smaller gas consumption and more satisfactory service will result therefrom.

Waste of Natural Gas in Carbon Black

Resolved, That the Bureau of Mines be asked to turn over to this Committee all data it may have on the carbon black industry with the view and purpose of helping this Committee to determine what part of Natural Gas now used to manufacture carbon black could be diverted into public utility lines.

Daylight Burning of Lamps

Resolved, That this Committee recommend that the State Authorities in the natural gas states take immediate steps to eliminate all daylight burning of outdoor lamps.

Flambeau Lamps

Resolved, That this Committee recommend that the State Authorities in the natural gas states take immediate steps to eliminate all unnecessary use of Flambeau Lamps.

Discontinuance of Low Set Burner Cooking Stoves

Resolved, That in the interest of improving the quality of service to the public and conserving the rapidly declining supply of natural gas, stove manufacturers should cease at once the manufacture and sale of low set burner natural gas stoves as well as natural gas stoves fitted with solid lids, and make only natural gas stoves with properly raised burners; that is, burners about 1¼ inches from the vessel bottom and fit all stoves with grid or open tops; and that all stove dealers cease displaying or selling low-set burning natural gas stoves, or stoves fitted with solid lids.

Be it further Resolved, That the Natural Gas Association of America be requested to ask each of its member companies to have their local representative in each town call upon each dealer displaying or selling natural gas cook stoves, and deliver to such dealer a copy of these resolutions, together with the request that such low-set burner stoves or natural gas stoves with solid tops be no longer displayed or sold and that each company member of the Natural Gas Association report back to such Association, and it in turn to report to this Committee the names of all towns where such requests on dealers have been made.

Rules Discontinuing Service to Prevent Waste

Resolved, That the Public Utilities Commission in every state where natural gas is used be requested to require every natural gas company within their respective states to formulate and put into effect by July 1st, 1920, reasonable rules and regulations, approved by the State Unity Commission, requiring that all natural gas must be used in an efficient manner and economical manner with proper appliances, and that on the failure of any patron to comply with such reasonable rules and regulations, service to be discontinued until such rules are complied with; that the following standards of waste elimination laid down in

the Bureau of Mines' Technical Paper No. 257, entitled "Waste and Correct Use of Natural Gas in the Home" be and are hereby recommended to natural gas companies as proper to be adopted:

(a) Improper adjustment of appliances, resulting in imperfect combustion.
(b) Low Burners — that is, burners more than 1¼ inches away from the cooking vessel on cook Stoves.
(c) Solid tops on cook stoves. Grid tops or skeleton lids only should be used.
(d) Use of gas in coal furnaces and stoves. Especially built gas heating appliances, giving an efficiency of at least 75% should be used.
(e) No hot water heater should be used that gives an efficiency of less than 75%.
(f) No tank heater, that is, tank with burner underneath, should be used without an outer jacket and flue connection.
(g) All daylight burning of lamps ought to be prohibited.

The prohibition of the foregoing wasteful uses of natural gas would —

(a) Greatly improve the quality of the service.
(b) Immediately convert low-pressure conditions into usuable service for cooking.
(c) Cut down the needed consumption during the cold weather period — where the demand is now greater than the available supply — so as in effect to make gas more available for all.
(d) Add 15 to 20 years to the period that natural gas will be available for domestic use.
(e) Because of the greatly increased efficiencies obtained — even with decidedly higher prices per 1000 cubic feet — would permit the domestic consumer to get the same service without a greater annual outlay of money.
(f) Permit the same small towns that are now too small for the introduction of manufactured gas to have gas service for a much longer period.

Be it further Resolved, That we recommend that the State Utility Commissions in each state where natural gas is used require that every distributing natural gas company in their respective states, on or before October 1st, 1920, inform and advise each of their patrons how to eliminate the wasteful use of natural gas, as indicated by the foregoing standards of waste elimination, and make an inspection of the appliances used by each of its patrons with a view of ascertaining whether or not natural gas is consumed in an efficient and economical manner, and that the said Companies report to the Public Utility Commissions of their respective states the name and address of each consumer using inefficient appliances or using gas herein designated as wasteful.

Raising Burning on Natural Gas Cook Stoves

Resolved, That in the interest of improving the quality of the service during the inevitable peak load low pressure in cold weather, and conserving the rapidly declining natural gas, that the State Authorities ask each Natural Gas Company to show its patrons how the burners on now low-set natural gas cooking stoves can be raised, and show how such stoves can be properly adjusted for low pressure gas service.

J. C. McDowell, *Chairman,*
John S. Rilling,
Miss Edna White,
S. S. Wyer,
Utilization Sub-Committee.

Copy of this was sent to all member companies of the Association by your secretary in Bulletin No. 57.

The next meeting of the committee was scheduled for Pittsburgh, April 16th and 17th, and on April 9th the gas company members of the general committee wired the Director of the Bureau of Mines, requesting that for various reasons, as expressed in the telegrams of Mr. J. B. Corrin and Mr. W. L. McCloy, the meeting scheduled for April 16th and 17th be postponed to a date subsequent to the Annual Meeting of the

Natural Gas Association of America and the following reply was received:

> "The next meeting to be held in Pittsburgh on April 16th and 17th is to consider only the recommendations made by the sub-committees which may or may not be approved by your main committee. After we have given consideration to these reports, the Secretary of the Interior must of course take them under consideration and, before he promulgates them, the Governors or their representatives from the natural gas states will have an opportunity to go over them. I therefore feel there is nothing to be gained by postponing our meeting in Pittsburgh. It is possible we might agree to submit to the Natural Gas Association at Buffalo our tentative agreement for their consideration."
>
> (Signed) MANNING.

But, on April 13th, we received a telegram from Dr. Manning, stating that on account of the railroad situation they had concluded it necessary to postpone, subject to call, the Natural Gas Conference to be held in Pittsburgh on April 16th, and 17th, and later official notice was received calling the meeting for Aprl 30th and May 1st, at Pittsburgh, at which meeting the following resolutions were adopted and recommendations made:

Resolved, That in the interest of conservation wherever practicable and expedient, all natural gas should be measured either at individual wells or in groups of wells where it is produced in the field and before it begins its journey to the ultimate consumer; that all consumers using gas from transmission lines have their supply measured; that all gas for operating compressors or other uses be measured; that all gas out of main lines into distributing plants be measured.

Resolved, That in the interests of good conservation and good service — wherever expedient — all gasoline that can be commercially separated from natural gas shall be so separated before the gas is started for the market.

Resolved, That the attention of the State Authorities be called to the necessity of having adequate service lines and ade-

quate house piping if satisfactory gas service is to be obtained, and we recommend that all such State Authorities follow the general recommendations laid down by the Bureau of Standards in its report now in preparation on "Standards for Gas Service".

Resolved, That the attention of the State Authorities be called to the necessity, from a public interest, of establishing or enacting legislation and enforcing regulations to reduce and limit and, whenever possible, prevent the carrying of stray electric currents on underground gas transmission systems, because where such stray electric currents — that have leaked off of the grounded return of single trolley electric railways — shunt around joints on the gas pipes or leave the gas pipes to go back into the soil, they must always remove a part of the metal and thereby produce what is known as "electrolysis", which is a disintegration of the pipe that will ultimately produce a hole, and thereby increase the leakage, as well as a life and property hazard.

Resolved, That the use of suction fans or vacuum pumps on the service lines or house piping on consumers' premises to draw or suck gas out of the distributing system should be prohibited, because they enable such consumers to take unfair and unwarranted advantage of other consumers, and at the same time they stimulate wasteful use of natural gas. We recommend that State Utility Commissions issue orders providing that all consumers that use suction fans or vacuum pumps will have their service entirely disconnected.

Resolved, That where manufactured gas stoves are available for natural gas that they be used, since by proper adjustment more satisfactory service will result therefrom.

Resolved, That the Bureau of Mines be asked to turn over to this committee all data it may have on the carbon black industry with the view and purpose of helping this committee to determine what part of natural gas now used to manufacture carbon black could be diverted into public utility lines.

Resolved, That this Committee recommend that the state authorities in the natural gas states take immediate steps to eliminate all daylight burning of outdoor lamps.

Resolved, That this Committee recommend that the state authorities in the natural gas states take immediate steps to eliminate all unnecessary use of flambeau lamps.

Resolved, That properly constructed stoves, such as are used for manufactured gas, fitted with open or grid tops and with proper burners set about 1¼ inches from bottom of vessel be used, more satisfaction being sure to result therefrom. That the Natural Gas Association of America take action to discourage the use of all stoves for natural gas which do not comply with above recommendations.

Resolved, That contracts between transportation and distribution companies shall be so drawn that the loss by leakage is to be suffered by the company in each case in whose system the leakage occurs. A flat price at the town border point of delivery is deemed preferable but it is a matter to be decided from other considerations whether the contract price shall be based upon a percentage of the sales price, or on a flat price at the town border point of delivery. Present contracts should be modified accordingly.

Resolved, That the principle of utilizing the gas to the lowest possible pressure before the field is finally abandoned is fully recognized, but the physical conditions existing in different fields are known to require different treatment. And specific recommendation dealing with the installation of compressor stations should be made on an engineering basis, covering the specific field where the installation is proposed.

Resolved, That in order to standardize the industry, it is recommended that in all natural gas pressure distribution regulation, whether state or municipal, the pressures be referred to in inches of water rather than ounces per square inch, and that all natural gas companies record and report their distributing pressures only in inches of water, one ounce of pressure equalling 1.7 inches of water pressure.

Resolved, That this committee recommend that each distributing company keep a record of pressures during the winter months at such points on its distributing system as will enable it to make a study of the same and determine therefrom what if anything can be done to improve and more equitably distribute

the gas supply to consumers connected with its system of lines and that the various state commissioners require said distributing companies to maintain well balanced distributing systems so that as nearly as possible consumers in all parts of each city shall receive equal service.

Resolved, That the State Utility Commissions of each state in which natural gas is produced request that every natural gas company in their respective states submit to them a report on or before October 1, 1920, indicating the extent to which natural gas is supplied for industrial as well as for domestic purposes; stating in detail what rearrangements in operating and financial conditions would be necessary or desirable to enable the companies to conserve their supply of natural gas for domestic use, adding such additional data as the individual company thinks wise to furnish.

Resolved, That a fair value be placed on gas in the field will immediately start conservation methods in the drilling and operation of gas wells and the saving and delivery of casing head gas from oil wells.

Resolved, That greater care be taken in the drilling of wells, in the matter of casing wells, and their control when completed. That necessary material to shut in or pack wells be provided at the well in advance of their being drilled in and that experienced men be employed.

Resolved, That more care be taken in the training of men in charge of gas wells.

Resolved, That the use of syphons in wells, the use of bailing machine and swabbing line be encouraged as against the blowing of wells.

Resolved, That gas be marketed from upper sands as drilled in rather than being cased off and marketed through Bradenhead where it is practical to do so.

Resolved, That more general use be made of the mud-laden process in the protection of gas sands from water from other sands, and the dissipation of gas into other strata.

Resolved, That the use of the gas engine be encouraged in the drilling of wells and where oil country boilers are used that

they be covered to reduce radiation and that such boilers use at least 12 feet of stack.

Resolved, That careful study be made of wells, inasmuch as conditions vary in different fields to the end that it may be determined the amount of gas taken from wells will not prove a detriment to life of wells and proper control of water be had.

Resolved, That the practice of "blowing heads" off wells for long periods to get open flow tests at stated intervals be discontinued. That pressure tests by closing "slide gates," or the use of other practical measuring schemes be used. That wells should only be "blowed" when practical men know it to be necessary.

Resolved, That drips on main lines or well connecting lines be *drained* and not blown.

Resolved, That casinghead gas in oil fields be gathered into gathering lines, treated for gasoline, and the treated gas sold back for operations and the surplus sold to transportation companies.

Resolved, That improved methods be introduced in separation of oil and gas when the two are produced together, and gas sold to transportation companies.

Resolved, That more care be taken of the small well.

Resolved, That compressing stations down to small units be encouraged.

Resolved, That a study be made of the use of centrally located electric generating plants where coal could be used or fuel and current transmitted to field compressing stations.

Resolved, That the use of high B. T. U. natural gas instead of gas oil in carburetting manufactured gas, where same is made to supplement the decline in production of natural gas be encouraged because the use of gas oil at 7¾ cents per gallon has the equivalent B. T. U. value of 108 cubic feet of natural gas at 1100 B. T. U. giving the gas a comparative value of 75 cents per M. cubic feet, and thereby helping conservation.

Resolved, That carbon black be made when gas is produced in isolated sections with no present or reasonably prospective market for gas being produced, when gasoline has been ex-

tracted and when practical and modern and improved methods are used.

Resolved, That the use of gas in field operations under low pressure be encouraged.

Resolved, That the closest co-operation be maintained between the producers, the gas companies, the public and the Public Service Commissions in order that the facts governing conditions be absolutely known by all parties and that a mutual advantage be gained by all.

The remainder of the Resolutions presented by the three sub-committees will be taken up at a later meeting.

We understand it is the intention of the Bureau of Mines to have the Secretary of the Interior formulate these into a set of rules and recommendations and call a conference of Governors, Public Utility Commissioners, Governmental and State Officials in Washington on May 25th, at which time these final recommendations will be submitted to them and their cooperation sought.

On April 28th, 1920, Dr. Manning wrote the following letter to all members of the committee:

I submit for your consideration the following plan:

The creation of a Board, consisting of a representative from the Bureau of Mines, one from the Bureau of Standards, two from the Natural Gas Association, two from the American Gas Association, two from the American Petroleum Institute, and two from public service bodies; the Director of the Bureau of Mines to act as Chairman.

(1) Transition from the use of natural gas to the use of artificial gas.
(2) Standardization of B. T. U. and c. p. of artificial and natural gas.
(3) The efficient utilization of various kinds of gas.
(4) The manufacture of artificial gas.
(5) The use of oil in gas making.

The proposed Board should consist of engineers and economists. It should raise funds for employing thoroughly compe-

tent engineers, economists, chemists, and other technical men to investigate the above problem. The funds should be allocated to the Bureau of Mines, the Bureau of Standards, or any other bodies as recommended by the Board. Some of the problems will be research, but many of them will relate to economic engineering in the transition from natural gas to to artificial gas, in changing from one standard of B. T. U. or c. p. to another, in reducing the fuel oil consumption in artificial gas, and questions of a like nature.

As you are aware, the failing supply of natural gas makes the change from natural gas to artificial gas inevitable and this change will involve many economic and technical problems that will concern all natural gas companies. As these companies will encounter the same difficulties as the artificial companies, it is advisable that the latter be represented on this Board, particularly as they are immediately concerned with some of the problems involved, as well as with the use of fuel oil and the efficient utilization of the various grades and qualities of gas.

A Board such as is proposed would centralize investigations and provide for having research and investigation made under men of the highest qualifications and under the direct supervision of disinterested Government agencies. No pains should be spared to employ the ablest men from outside the Government Service at such salaries as may be necessary. These investigations properly conducted will prove of inestimable value both to the natural and the artificial gas companies and to the public. Not only will they yield technologic information of the utmost importance, but this information will be put forth by an impartial, disiinterested, and authoritative source which will carry the greatest weight with the public and with the gas companies.

For this reason it is recommended that representatives of public utility bodies be placed on the Board. These representatives should be engineers and the public utility boards should be advised to select thoroughly competent engineers for the purpose, even though the boards have to pay such engineers a considerable salary.

The actual work should not be done by the Board but should be done with the funds provided by the Board, all ex-

penditures to be under the direct supervision of the chairman and under the review of the Board. The engineers employed by the Board should report to the chairman and not come into direct contact with any interested parties. The Board should, of course, be affiliated with your natural gas committee, particularly the sub-committee on Utilization. Let me point out that the Board deals with only one phase of the functions of the natural gas committee and that possibly other boards could be formed to take up other questions of natural gas conservation.

I suggest that this memorandum be gone over carefully and that you be prepared to discuss it at the next committee meeting. Also I suggest that the plan be submitted to the members of the Natural Gas Association for their consideration at their meeting in Buffalo, New York, May 17th, 1920.

In case the Committee approves of this plan, I suggest that the Secretary of the Interior be requested to submit it to the Secretary of Commerce and to the president of the Natural Gas and American Gas Associations and the president of the American Petroleum Institute, and that when the Secretary calls his conference of Governors or representatives of Governors in the natural gas using states the same plan is submitted to them.

The suggestion may be made to the various states that in order to distribute the expenses of the two representatives of the public service bodies, a fund be raised among the various states to employ, if necessary two highly competent engineers to represent them, or, at least, that the states come to an understanding as to how the public service bodies should be represented. I think it is of the greatest importance that the public be represented in such a manner that it may understand and have confidence in any results of the investigations made.

Further details relating to investigations and researches which should be made, and estimates of costs will be submitted at such time as this committee may reqeust.

President Oliphant: Gentlemen, what shall be done with the Report of the Committee on Conservation?

It was then moved, seconded and carried that a hearty rising vote of thanks be tendered to the Chairman, J. B. Corrin,

and to the Members of the Committee on Conservation for the exhaustive and thorough report above submitted.

President Oliphant: Gentlemen, the next order of business is a paper on the subject of "Federal Taxation of Gas Wells" by Roswell H. Johnson. I now have the pleasure of presenting to you Mr. Johnson (applause).

Mr. Johnson: In preparing this paper I had thought best to write something which will be reasonably useful to those who have given a great deal of attention to this subject; but I know very well that such a paper would not be readable on such an occasion as this where a great many of you have not had to dig into the minutiae of appraisal. So I shall talk to you from an outline on some of the main points that are involved.

In my paper I have summarized first the literature which can be obtained to help out in these tax reports. The subject is a large one and serious study has to be given to the literature which is now becoming rather voluminous; but to those seven items referred to on page three of the paper I want to add this fact which is of very great importance and which will lead up to a recommendation on my part later this afternoon. The reports have now begun to come back to the gas companies. With those reports comes a letter from the department in which they take exception to certain things and ask for additional data on certain points. Those rulings and those exceptions give us for the first time a line on what the department holds should be done on a number of questions which are not clear from the manual, the regulations and the law. The law and regulations on quite a number of points are not specific. The burden of deciding has been thrown upon us. I am down to Washington frequently and I try to get all I can from the department in the way of committal on these points but they take the attiude — and of course, you cannot blame them for that — that "We will cross that bridge when we get to it. When we have to decide on that point in some report then we will decide but we prefer not to decide in answer to any one's question because we might in our further study of this situation think best to change our mind and, of course, we wish to have as few changes as possible."

But these rulings are now being made on these return reports — and nearly all gas reports are or will be coming back. By collecting these rulings it will be seen that on a very considerable number of points there is a decision now for what was previously an open question. Thus as time goes on these questions which are perplexing now become settled.

Now, taking up the income tax law. First, we have the historic date of March 1st, 1913. That is the date when the law went into effect and it is on that date that we must fix the fair exchange value of the producing leases. The whole of the producing lease has to be valuated both the productive part and the non-productive part but a lease which is wholly unproductive is not valued.

"The fair exchange value" is defined by the department as being measured exactly by the sales which take place at just that time in properties which were just similar. That is to find the true fair exchange value we would have to have a sale that takes place at the same time and with just a similar property, between a willing buyer and a willing seller. Where those specifications can be met the fair exchange value can be set up with relatively little difficulty but in gas more than in oil it is very hard to get these cases. So in gas more than in oil it becomes necessary for us to fall back on some other means of getting fair exchange value. The only other means we can utilize is to make an analytical appraisement of the property as of that date.

There are many ways of appraising. The method which I suggested in this paper and which in its main outline is already receiving the approval of the department is to construct a curve of future expected prices at the well, not the price to thé consumer but the field price of the gas. That is a matter that has just lately been decided and which I fear may disturb a good deal of work which a number of you have already started upon. The curve of future costs of producing that gas, of course, to the point of sale only also should be worked out. That gives us the expected profit for each year in the future and by using compound discount we can get the present value by adding them together thus giving us the total productive value of the lease. But this usually has to be reduced — as the buyer under most circum-

stances will not pay the full productive value ordinarily making allowance for risk.

In some cases as in McKeesport the allowance is on the other side. There is an inflation element in the price. Under such circumstances one could not use the analytical appraisal because the properties were worth very much more than the productive value but would use the sale price and not try to work out an appraisal on any analytical basis. This appraisal must be set up by the lease and not the whole property. Some returns have been sent back where an attempt was made to appraise the whole property so that we know definitely their attitude on that point. This will be particularly difficult where a group of leases were bought at one time for one sale's price. Under those circumstances the department insists upon the prorating of that price among these several leases.

This appraisal as of March 1, 1913, must be an appraisal as of that date. One must ignore all knowledge obtained subsequent to that date. It must be based upon data of that date. After this fair exchange value is obtained upon the well and on the undeveloped part of the lease upon which these wells were drilled then the cost of the physical property on the lease March 1, 1913, is calculated. If that property was bought some little time before March 1st, 1913, basis so that we get the value of physical properties of that date. That cost is subtracted from the fair exchange value.

Now the difference is what is called the depletable capital sum.. It represents the value of the oil and gas in the ground, and as such can be deducted from earnings during the succeeding years in getting at the taxable income. The physical property account which was subtracted will be the depreciable capital sum after the value of the salvage has been subtracted and this also will be returned as depreciation allowance during successive years. It is possible to depreciate on the straight line basis — the familiar method of accountants — or else to depreciate at the same rate at which one depletes. That brings up the question of working out the rate at which the depletable capital sum is to be distributed through the years. To do that

the unit cost system is used by the department and by this system there is estimated the total available units of production to be expected and then dividing the value by these units to obtain the unit cost for depletion.

The fair exchange value less the cost of the physical property, being the depletable capital sum, represents value attributable solely to the gas in the ground. It in turn, however, should be divided into three parts, one representing the cost of the gas reserve, one that of drilling and exploration, earnings on both of which are merely a return of capital and the remaining portions of the value, the earnings from which are on an appreciation shown by the appraisal over cost so that such earnings can be transferred to surplus and increase the invested capital so that they are not disturbed in dividends.

We now have the amount which is to be taken as depletion and depreciation allowance through the years in proportion to which depreciation and depletion is sustained.

The depletion unit with oil wells is upon the basis of the lease, but in gas they permit a deviation from that general rule and permit depletion to be upon the basis of the pool or where pools are with difficulty divided up, they will accept a geographical district. One must not take one's whole gas holdings and deplete it all together as it must be broken up into pools or geographic districts, and depleted separately.

Now, we come to the peculiar and unique feature of this law, namely, the Discovery Clause. It is this discovery clause which goes very far to adjust the rigors of the income tax law to our industry. If it were not for this discovery clause we could return only the cost of everything acquired since March 1st, 1913, but by virtue of the discovery clause we are permitted to take into consideration the value of wells that have come in since March 1st, 1913, under certain circumstances, which in gas comprise a considerable proportion of the wells. Now, that is a provision which is treated as a privilege by the department. The department feels that the company must make a case — a fairly strong case to be permitted this privilege which is relatively an important one as the industries go and it is for that reason that

they are demanding so much data substantiating the claim of discovery and the appraisal of the discovery rights.

A discovery appraisal can be done as of the date of the discovery or thirty days thereafter. Of course, one would normally appraise as of the date of discovery because a well is more valuable then. There is thirty days gas in it which one does not have in the well at the end of the thirty days. Under certain circumstances, however, it will be best to wait the thirty days for fuller data, but normally one would take it at the beginning. The value of the supporting acreage as such is derived from what it was after being newly drilled by substracting the cost of material and drilling, but the remaining acreage usually requires a further deduction because of the greater risk of investment and loss of pressure from deferrment of drilling. If this discovery was made on the undeveloped part of a lease that was appraised as of March 1, 1913, then, of course, it is only the excess of the discovery value over the 1913 value. But as many discoveries will be on leases that had no well in 1913 no deduction of that sort is necessary.

Now, the question arises what conditions must be fulfilled to have the discovery right? That is one of the most important features of this law — to be able to make a discovery right claim for every discovery well you have, because of the importance of obtaining depletion allowance, for every well entitled to it. Now, the things that are necessary are these: The well must come in on land that was purchased prior to the time that that land was included in the 160 acre block that had some older gas well at its center on that lease.

Then there is one further condition, this well must be disproportionate in value over cost. Now, what is the measure of disproportion? Here again, of course, we can not tell until more rulings come in but I know it is more than 25 percent and that it is probably 50 percent or only a little less.

Now, the area that is to be appraised is a matter upon which there has been a great deal of uncertainty. The regulations are not decisive on this point and one really has to know what interpretation the department is giving it in order to apply it to a particular case. Now, the interpretation of the department is

at the present time that the whole 160 acres, in so far as it lies within the lease upon which the discovery well lies is the unit to be appraised.

Now, some of it, of course, is supporting acreage to the well. In so far as there is more acreage than is usually necessary to support a well that also can be appraised.

But here is the curious thing, it cannot be appraised as proven acreage although the law defines this 150 acres as proven. It can only be appraised on the basis of fair exchange value and, of course, such outlying acreage is not valued as proven. So that it must be valued on the basis of the fair exchange value not as to its being literally proven according to the Government language. An oil well and a gas well do not interfere with each other with respect to the discovery clause. If this land is proven land for oil and we now get a gas well, which for gas alone would be a commercial well, because then you can make a claim for gas, but if you have an oil well with some gas in it that would not do. The product for which you make the discovery must be of sufficient abundance so that it alone would satisfy the commercial supply and justify the sale by itself.

If one has a proven area in one sand and you may discover the same product in another sand, and get discovery on it. In general then one must have another sand or another product in order to claim such a discovery right. It is particularly because of these last two facts that the department is demanding so much data from us because they want to get all the data they can to check these discovery claims. It is very much to one's interest, of course, to make sure that one does not miss a discovery claim and it is very much to their interests, of course, that they check every discovery claim that is made.

The excess profits tax is based on invested capital, not on valuation. However, there is such a thing as surplus that can get into the invested capital account in addition to the cash paid in. Depreciation and depletion are cutting invested capital down every year and new capital goes in and under certain circumstances earnings may be added as surplus to invested capital for the ensuing year provided it was not distributed as dividends. To go in to surplus it must be money that is earned on the ap-

preciation that is shown in the appraisal as over cost. Money which is merely returning the cost cannot get into surplus even though it is not divided up into dividends and put into the business. This is a very fortunate privilege on account of the discovery clause because the discovery clause permits us to take into consideration a good deal of value above the costs. Since invested capital is being cut down rapidly year by year and important relief can be had through the discovery clause. What should be our attitude toward the law regulations and interpretations.

I think that the excess profit law should be abolished but the income tax law has come to stay. The excess profits law is recognized by Thomas S. Adams, who has been chief financial expert to the Treasury Department as being a unique law to be used only under stress of urgency of war. I think there is a general feeling that the excess profits tax ought to go, but if the excess profits tax goes — and it brings in a great deal of money, it is not going to be possible, in my opinion, to reduce the income tax rates this coming year. If the excess profits tax and the income tax both go, then some decidedly heavy taxation of a new sort would have to be introduced to replace them.

I do not think that it would pay the industry to try to have the income tax law abandoned in favor of either a production tax or a sales tax. The income tax law as we have it by virtue of depletion allowances and by virtue of the discovery privilege, gives an adjustment to particular companies that these companies sorely needed. The income tax law and the regulations as they stand are unique to the extent that they recognize the hazard and variation of the rate of depletion of such properties. If the old income tax law of 1913 still prevailed, especially during the heavy taxes of the last few years, it would have been a terrible blow to the industry, but it is in the relief that we get by reason of the depletion allowances and the discovery right that takes cognizance of the peculiar situation of the gas industry that has prevented disaster. The gas industry is a peculiar situation in that its prices cannot readily adjust themselves to cost because of its public utility features, and at the same time it has all the hazards of the mining industry with climbing costs

and diminishing returns. For that reason the income tax law by which the industry is capable of receiving special treatment, a special treatment it cannot get in a production tax makes it far preferable. I believe it would be a mistake for either the oil or gas industry to go on a Federal production tax basis, because such a tax would not be expected to make the adjustment for our industry which this industry has to have. It is not the industry as a whole so much as it is the difference between this company and that company. How else, except by depletion allowances and the discovery clause, can we get that adjustment? A production tax sweeps evenly along the line. It hits everybody regardless of his situation. This industry must have allowances and receive privileges commensurate with the excessive hazards of the business, and the income tax law has shown itself capable of being so adjusted as to have that necessary flexibility.

Now in the matter of a sales tax, which some think should replace the income tax and the excess profits tax, it is largely a question, in my opinion, as to whether any effort directed toward a sales tax can be effective, this tax, would be worth while. In my opinion it is politically futile and time spent on it is bound to be of no avail. But this, of course, is a matter of judging the public's attitude on those things. I simply offer that as my opinion.

There is one thing, however, in which I think, that we may feel that some change is decidedly desirable. Our petition should not be for the repeal of the law, but for relief from the excess of detail demanded in filling out Form O and its accompanying sheets. The excessive detail called for by Form O should be modified. So long as we have an allowance for depletion, and this we must have, compliance with the income tax will be a burden, but there are at least five points at which the burden could be materially lightened and yet give the Department a sound basis for checking the report.

Form O has saved some work, as compared with Form N, but in a number of other respects it has increased the labor enormously. Form O applies only to the producing lease; whereas, under Forms M and N one had to file a great deal of data on every lease. But Form O is now calling for data from

us that in its volume and in the difficulty of obtaining it imposes an extremely heavy burden upon the industry. A great many of you do not need to be told that. You have lived through the agony of trying to get that data, and if you have not already received your report back, it is probably going to come back to you.

My recommendation is, that this Association appoint a Committee, say of five, to formulate a petition with brief for the simplification of Form O, and to present it to the Department and to follow generally the tax situation and advise the Executive Board in the event that an effort is made to change the law and regulations.

Let me just mention two items of Form O to show the very burden that I think could be eliminated. Of course, we must not ask that in Form O anything should be eliminated that the examiners really need to properly check the report. We have got to recognize that there must always be a Form O that should be reckoned with as long as we have an income tax that makes adjustability a feature in trying to accommodate the tax to the varying conditions of hazard to which I have heretofore referred. First, for everyone of these discovery claims one must give the compass bearing and the distance from that well of every other well within a distance of about three-fifths of a mile. Now the burden and labor involved in connection with it is great. Many oil wells require four hours for the recording of these measurements. So you can see the burden that is involved in it. It probably would not be used by the examiner. I think the examiner would base his conclusions on an examination of the map. This is one specific instance. I will mention just one other. A map is asked for at the end of the taxable year, showing the status of the wells at that time, and showing a classification of the land under five heads. This is in addition to the map of March 1st, 1913, and that showing our discovery claims. Now this demand comes at the end of the taxable year for a third set of maps covering the entire producing property, and giving a classification of the land under five heads. The burden of that last item, which does not seem to me to be necessary for the real checking of this report, is very considerable. That

map will amount to probably fifteen per cent of the cost of the whole report. These reports are full enough and long enough without being required to furnish any unnecessary detail.

So this recommendation that we have a Committee of five appointed to see what can be done toward cutting down the burden of preparing these returns and reports.

Let me give you this one further suggestion. In the exceptions that I have seen filed on reports so far, there is a strong emphasis upon the fact that such and such an item is not fully explained. There must be an effort made in writing up the reports to explain the figures fully, a fact which, of course, increases the time and expense placed upon these reports. This committee of five should follow up generally the tax situation and advise the Executive Board in the event that any effort is made to change the law or the regulations. I fear that the discovery clause might be eliminated from the law and this, in my opinion, would be very much to the detriment of the industry. It might be done on the ground of this great work that the discovery clause has led us into. I think that would be a mistake. The thing to do is to cut the work down but hold the discovery clause.

This committee should also receive, through the Secretary of this Association, copies of letters received by the members of the Association which they receive with their returned reports, from the Treasury Department, taking exceptions to their reports and explaining why they were returned, so that these rulings and exceptions by the Department may be compiled and distributed to the membership as pamphlets from time to time. The reason for that is, if you do not have access to those letters, which otherwise will simply go into the files of the respective companies, and not be seen by the other members of the Association, you will be doing things that will necessitate your doing them over again later. In other words, all of us here ought to have the opportunity of knowing why the other fellow's report was sent back. There is nothing in our affairs as related to a particular company that is so confidential as to interfere with that interchange of views, and it would go very, very far to show us just how to prepare one of these reports. In this way a great

deal of labor can be saved which would otherwise be spent in making out schedules along lines which will lead to their rejection. There are a number of facts with reference to which the attitude of the Department cannot be known until they pass on some of the returns now in. It is obvious that their rulings should be quickly disseminated among the members.

Already since the manuscript of this paper was written two items have arisen in this way which require its revision. The matter is in flux, and the only way for us to keep our fingers on these changes is by this device which I have suggested, and which, I feel sure, would save a great deal of labor. (Applause).

President Oliphant: Gentlemen, you have all heard a very interesting and instructive resume of Mr. Johnson's paper, together with certain recommendations and suggestions. I do not know how we can discuss it, but I would suggest that the subject is now before the Association for discussion and I am sure Mr. Johnson would be glad to answer any questions that any member of the Association would like to have answered by him. He has very kindly consented to answer any questions with reference to any point upon which any member desires information at this time.

Dr. I. C. White: I would like to ask Mr. Johnson what he would do in a case where the oil holdings were held on royalty.

Mr. Johnson: The oil royalty owner is, for the most part, ignorant of this whole situation. He is aloof, generally speaking, from the operation. In most cases he is simply returning his royalties as earnings, without making any deductions whatsoever for depletion allowance. He is entitled to depletion allowance and he should certainly have it. It is very unfortunate that most of them do not know anything about it and are not claiming depletion losses.

President Oliphant: Is there anybody else who would like to ask Mr. Johnson a question?

Mr. O'Brien: I would like to know if you think it would be reasonable in getting a basis for your valuation on a gas well, to base it say, on twenty-five per cent of the open flow over the

period of years which you think would be the life of the well, at the price of the well.

MR. JOHNSON: The Department is not unfriendly to the idea of bringing the profits of these several future years to the present time by means of compound discount. In other words, that money that is realized in one of these years in the future should be converted into present worth. Another feature is that they like to have a sliding cost. Perhaps they would not care for a sliding cost if you are willing to accept a flat price for the gas. I advise, however, that you claim the advancing price for gas because the logic, it seems to me is absolutely certain, that that will come; but if you claim that you should submit your evidence for the advancing cost and that advancing cost ought to be the cost to handle at the well, I would not use flat 25% but charge it on a curve for the life of the well.

MR. O'BRIEN: Would you consider if the discovery well proved up 160 acres, only such part applies to you as falls within the 160 acres of your lease That is the point, is it?

MR. JOHNSON: Yes.

MR. O'BRIEN: If it proved up possibly forty acres on the adjoining lease owned by another party, then what?

MR. JOHNSON: You have nothing to do with that. If he comes in subsequently, or you subsequently on that other lease you owned, it does not hurt this. Your 160 acres is confined to this one lease that you are on and that you own.

MR. O'BRIEN: Now, as I understand it, the well is in the center of 160 acres; that is proven property, according to the ruling?

MR. JOHNSON: Yes.

MR. O'BRIEN: Suppose you drill down the line and you strike another well where the 160 acres of land surrounding the well would go over on an adjoining lease, say 80 acres. As I understand it, it is only that part of the 160 acres that falls within that property that you have proven, which might only be 80 acres, or only 40 acres?

MR. JOHNSON: That is true.

MR. O'BRIEN: Thank you very much.

MR. JOHNSON: The date of completion is one of the very important things in this matter of discovery, and it is important that companies should interchange among each other two items, especially one, the date of completion of their several wells, because neither are in a situation to fully substantiate their respective claims without the date of completion, because the essence of the discovery claim is that the land should not be a part of a "proven area" at the time of acquisition; second, the date of acquisition of the lease. These two dates are two very important items and it is very important that companies should be very free in the matter of interchange of data to help substantiate each other's claims. It would be well for two or three companies working in one pool to make sure that they each have a full set of dates of completion in their reports.

MR. O'BRIEN: I am using the three year basis. For example, I use twenty-five percent the first year — open flow, and the second year the open flow would only be 66⅔ of the previous year, and the third year it would be 33⅓, or in other words, 33⅓ per cent, depletion for the three years, depleting it by one-third until it was depleted out.

MR. JOHNSON: One reason for not taking a flat twenty-five percent of your capacity to get that yield is there is so much more gas the first year, and assuming your yield is only twenty-five percent of your capacity, you are going to do yourself an injustice by using that standard or by taking twenty-five percent of the large amount of gas the first year. It is a serious thing to under-claim in that first year which is the largest. I think it unwise to use a flat twenty-five percent. I would try to get the ratio of capacity to yield constant for each year. Of course, where you have metered wells, you would not encounter that difficulty. Then you would have an ideal situation. But generally we do not have that, and have to work from capacity on some percentage basis.

MR. W. Y. CARTWRIGHT: Mr. Johnson, did I understand you to say that operating companies might expect the return of all their tax returns in the last four years?

MR. JOHNSON: I did not say anything about the length of time, but I should say, in answer to your question, that for 1917,

'18 and '19 they are very likely to come back in most cases, judging by the detail upon which they have founded exceptions on some reports, detail which I am quite sure would nearly always be omitted from the written reports.

MR. CARTWRIGHT: Are they returning them all at once, or taking them by years?

MR. JOHNSON: They are coming very slowly indeed. Because a report does not come back soon, it simply means that it is at the bottom of the pile and it may be a long time before they get to it .

MR. CARTWRIGHT: By the rate of depletion that is now going on in the gas industry, gas will be almost gone by the time some of them come back. (Laughter).

MR. JOHNSON: There is a law of limitation of five years and it is necessary to get in a claim for abatement within five years. The time of filing your 1917 report was as of March 15, 1918.

The checking that the Department is going to do will be most rigorous in the matter of discoveries especially. Where a strong claim is made under the right of discovery, there you will find the most rigorous checking.

MR. W. M. DILL: Mr. Johnson, I understood you to say in the beginning if somebody drilled along your line and discovered a well he is supposed to claim 160 acres around it and he has an acreage within that 160 acre radius but suppose he drills a well which laps over on your individual lease, can you claim discovery on it?

MR. JOHNSON: If you acquired your lease prior to the time it became proven by his well then you get your discovery when you later drill it.

MR. DILL: You get your discovery?

MR. JOHNSON: Yes, but if you acquired it afterwards, you would not. Let me give you the theory of the matter and it helps to understand it. Their idea is this, if you can go out and buy what they call proven land you are entitled to the reward of having been an enterpriser. You are like a manufacturer. That will not give you recognition. The theory is if you buy that land prior to the time it became proven and held it,

then you are an enterpriser who took hazards and you are entitled to some relief in this matter.

MR. DILL: Each additional well on that lease gives you the right of discovery, is that true?

MR. JOHNSON: You mean that first lease we were talking about.

MR. DILL: Yes.

MR. JOHNSON: No, that is not quite true for this reason: Let us assume one very large lease that is yours and no one else around it to keep it as simple as we can, so that we can all undertand it. You put down a well. You get your discovery right to 160 acres. Now, you put down a well that is just next to the first well and you measure 160 acres around that. Now, this second 160 acre tract will outlap the first 160 acre tract. In so far as it overlaps the first 160 acres, you can get a claim on that overlap. But you just have a little strip of territory. Its value is probably not more than fifty percent of the whole cost of the well and that land. You usually have to wait until you have drilled — in the case of gas you get it sooner than oil but in oil it would be your number five, perhaps, before you get out there. Then you would claim 160 acres but about 80 acres of that would be overlapped which you cannot claim because it falls within the other tract already claimed. When leases are small of course that privilege will not amount to much.

MR. DILL: Another thing. According to Form M they require a lot of maps and data. They want maps showing the nearest well within 3200 feet.

MR. JOHNSON: They want more than a map. They want a compass bearing and the distance of every well within this, $\frac{3}{8}$ of a mile roughly.

MR. DILL: And they will not allow you any depletion if you do not give them that data?

MR. JOHNSON: Well, I think there is hope that they will not be strictly rigorous on that point which is why I recommend the committee.

MR. DILL: That is pretty hard to obtain.

MR. JOHNSON: Yes, and you may find yourself in a position where you cannot obtain some of the data that they require.

That is one of the things I think we ought to try to do, is to have them relax their rigor on that point. Their attitude is that you are getting a privilege and in order to substantiate your claim you have to have the proof. They say "The burden is not on us. It rests on you"; and that is why they have been willing to throw this heavy burden on us because of the advantages we obtain from it if our proofs are sufficient. But of course, there is a limit to that and I am sure they would not want to go so far as to say "We will make this so hard for you that you will not claim it." That would be utterly unreasonable. I do not believe that they are unreasonable to that extent, so I believe there is a chance that we can get some relief from all of the details and burdens now imposed by Form O. The burden is really serious because when you count the amount of time that has to be taken into consideration to furnish this data it amounts to quite a little and it is just like adding that much to the tax.

Mr. Frank L. Chase: Mr. President, may I ask one question?

President Oliphant: Certainly.

Mr. Chase: I would like to ask Mr. Johnson whether there is any data available as to the cost on the part of the government for the collection of this tax on oil and gas property? That I suppose is unimportant in Washington but I would like to have that information if it is available.

Mr. Johnson: The data has never been ascertained or at least given out if ascertained. I do know this, that the directors of the oil and gas section have always had a great deal of difficulty in getting enough budget to properly man their work, and one of the difficulties arises from the fact that they find it hard to man it as it should be manned.

Now, of course, in throwing this burden upon us of preparing all this material, they are also increasing their own burden to an extent which we should not overlook. They know however that they are in for a very big job and it is going to take a very long time.

Mr. Chase: Have you any idea as to the total cost to both the Government and the various corporations represented in percentage as to the amount of money received by taxation? I

mean this form of taxation? I ask that because the cost to the companies is enormous. Then in addition to that there is a large expense on the part of the Government itself and I was wondering whether you had ever formulated in your own mind some ideas as to what that cost would be in the way of percentage to the amount of taxes collected.

Mr. Johnson: I haven't any figures on that but there are two observations I would make in this connection. In the first place if we had no depreciation allowance and no discovery clause I feel sure that it would cost the industry in addition more than ten times this cost. Further I would like to observe that with a reasonable revision of Form O, that cost in my opinion could be cut to fifty per cent or from fifty to sixty per cent of what it is now. In other words, I think forty per cent of that burden could be saved and should be saved if they will simplify that to the extent that I think they can simplify it and yet have a fair basis for checking.

President Oliphant: Any more questions, gentlemen?

Mr. Patton: Did I understand you to say, Mr. Johnson, with reference to the surplus, before it is allowed your entire costs must be returned?

Mr. Johnson: No; it is not necessary that it should all be repaid first, but in a particular year the earnings should be divided into two parts, one part representing the proportion which constitutes return of capital and the other part the proportion which is capable of becoming surplus. That depends upon how much the value of your property exceeds its costs. For instance, suppose the value of your property and the costs are the same. Then of course, there would be no surplus and it would all be returned as capital. If the value was twice its cost then one-half of this earning you bring in is capable of going into surplus. To go into surplus though it would have to be realized and then not divided up as dividends but held as surplus.

Mr. D. L. Cobb: I would like to ask Mr. Johnson if the appraisal can be proven and substantiated by the engineers of the company or what character of proof is required by the government? What I am trying to get at is, suppose a company

has to rely on its own engineers or engineers employed by it to appraise this property and the condition of a willing buyer and a willing seller does not obtain because there is no competition between them so that the company goes out and has its engineers or the engineers employed by it to make appraisal. Is that sufficient? I cannot see what else they would have to substantiate that value that is set up unless it is data from its production and from its wells. I would like to ask if the Government accepts that as proof of the value set up.

MR. JOHNSON: The Department is willing to examine an appraisal made by an engineer. They will look at the data; look at the method employed and see if any feature of that method employed is one of the things that they forbid. If not they will look at that value and take it for what it is worth. Of course, you must remember that they have a lot of sale prices and various data that no one company has because they are passing continually on sales of capital assets which are a part of the tax. Then again they have some ideas of their own on sale prices and they will look at the appraisal price and if they feel that that appraisal price is excessive by so much then they will act accordingly. In other words, if they find that buyers were allowing so much discount for risk they will say, "Your appraisal in order to get down to a fair exchange value should have taken off such and such a discount for risk," and if you do not, they probably will and add that to the tax or else send it back for revision.

PRESIDENT OLIPHANT: Any other questions, gentlemen? If not, Mr. Johnson, we certainly wish to thank you very much indeed for the time and for the instructive and interesting paper presented as well as for the valuable discussion which has just closed.

Mr. Johnson, in your address you said that you recommended a committee of five. We have a note of that in our minutes and it will be taken up, considered and acted upon at the next meeting of the Board of Directors.

MR. JOHNSON: I thank you.

The following paper was then presented by Mr. Roswell H. Johnson:

FEDERAL TAXATION OF GAS WELLS

By Roswell H. Johnson

To prepare the tax return of a natural gas company, one should provide himself with the following literature:

1. A copy of the Act, which is Public Document No. 254, 65th Congress. It may be had on application to a congressman.

2. Bureau of Mines Bulletin, No. 177.

3. Regulations 33 and 45 (edition with addenda) of the Treasury Department.

4. Form O, of the Treasury Department.

5. The Manual of the Oil and Gas Industry, published by the Department. This Manual is now out of print, but a private reprint has been published by John Wiley and Sons, 432 Fourth Avenue, New York.

6. Application should be made to the Bureau of Mines to receive the new bulletin on decline curves by Willard W. Cutler, Jr., when it appears.

7. Subscribe to the Income Tax Bulletin Service, Superintendent of Documents, Washington, D. C., $2.00.

INCOME TAX FOR 1919

In preparing the tax for 1919, one starts with Form O. The first schedules to be filled out are I, IV, VI & VII. The remaining schedules are dependent upon these. Schedule I calls for cost of property as of date of acquisition. The blanks must be filled out separately for each producing lease and it offers little difficulty except that some of the data may not be obtainable. In some of such cases the bonus may have been only nominal so that little harm is suffered under those circumstances. Where the bonus was nominal and other expenses were charged as such and one knows that the capital to be ascertained while obtainable would not justify the search, one is justified in writing across a number

of these entries "cost only nominal and not claimed." Nearly every gas company has a number of abandoned leases, the whole cost of which is so low and always so difficult to ascertain that it is advisable to merely state that there have been such and the costs were not large enough to warrant preparation of the data to claim the invested capital.

Schedules IV, VI and VII offer little difficulty and lead up to the very difficult Schedule II. This is the valuation schedule and is made out for properties as of March 1, 1913, the beginning of the income tax law. The most obvious way to ascertain "fair exchange value" would be to cite sales of similar properties. Where such sales are of truly similar properties and between a willing buyer and willing seller at the same date it is the exact index of "fair exchange value." Such sales are almost always non-existent so it becomes a question of how dissimilar the property may be and yet permit still the analogy to be drawn. The sale must have taken place at very nearly the same time because the prospect of future price changes is constantly changing and hence, the tone of the market. Lastly, there must be the condition of a willing buyer and a willing seller, a condition which by no means always pertains in the gas business, since there is generally a restriction on the freedom of exchange between a company or individual without pipe line and one with a pipe line and selling to consumers. Only two gas pools furnish sales of usuable sort, so far as known to us, so that probably very many of the gas properties must be appraised analytically. These pools, McKeesport and Elk City are each unique and not comparable to other pools.

The appraisal of a gas property is vastly more difficult than that of an oil property, and furthermore, there has been very much less written and very much less data collected that would be of use in such appraisal. Yet, such appraisals can be and are made.

The method recommended is to establish first a predicted price curve for what may reasonably have been expected to be the probable future prices at the time of appraisal. This is best obtained by taking a curve of past prices and then continuing it

into the future on the same average percentage of advance. This gives a curve that is too conservative but safe, since it never reaches even the present price of artificial gas in the life of a well. This extrapolation is most conveniently done by drawing a straight line on semi-logarithmic paper which automatically gives a regular percentage advance in successive years. One may also calculate in the same way the advance in maintenance costs. From these one may get an average expected profit per unit for each successive year in the future, until the abandonment of the well. The price at the well, not that to the consumer must be used.

The next task is to get the yield which the well will produce in the successive years. Where the wells are metered, as at McKeesport, this is a less difficult task, but in other instances yield cannot be had directly and the capacity must be obtained at the successive intervals by calculating from the open flow readings or the minute pressures which have been read. Minute pressures taken by merely closing the gate into the line at that line pressure give a figure quite different from the open flow capacity obtained by the minute pressure formula if taken after blowing. The open flow capacity obtained is best reduced to yield values for the several years by the use of the ratios given given by Weymouth. However, if the history of a line pressure is so erratic that no regular change of ratio can be used, one is forced in these cases to fall back on the general ratio of yield to capacity. Wyer gives 25% as an average value but this should be ascertained for the company or pool in question. However, if minute pressure from line is used to compute a "capacity", for which the name "going capacity" is proposed, the yield will constitute a higher percentage thereof.

The greatest difficulty in working out a gas capacity or yield decline curve, lies in the fact that a number of the wells are pulled on so much less, either because their well pressure is opposed to a relatively high line pressure or else because they are held as reserve so that they cannot be used in working out the decline curve of a typical well. After the expected profits are determined each year by this method each one is multiplied by a compound discount factor for its year. None of the published

"present worth" or compound discount tables are available as they all start with a full year and assume that the money is not realized till the end of the year. It should be observed that if the appraisal is of March 1, 1913, that the compound discount factors should be calculated on the basis that the average dollar is received one-half of the period from the beginning, i. e. at the end of five months in the first ten months period and at the end of six months in the subsequent periods. The rate of compound discount to be used is influenced by the reluctance of the investor to invest under the circumstances. To the sum of the discounted future expected profits add the discounted value of the eventual salvage.

The composite curve can be constructed following the method of Beal's family curve. This can be done by his graphic method for which the term "shingling" is proposed or by calculation from the corresponding parts of many well declines as described in the Manual of the Oil and Gas Industry for which the term "segmental" curve is proposed. If the family curve constructed by either method does not extend to the economic limit it should be extrapolated by finding the nearest suitable hyperbola by the method of shifting the origin or by using the exponential curve if it gives a better fit. Either method is easy because they constitute straight lines on logarithmic and semi-logarithmic paper respectfully.

Except under conditions of inflation gas property buyers are unwilling to pay up to the full productive value expected. The compound discount factor used may recognize any needed discount for risk or a further discount of risk may be necessary in the appraisal of some wells. However in the valuation of undrilled acreage, a further deduction as a risk factor and for deferment resulting in loss of pressure will nearly always be necessary.

Form O calls for the valuation and classification of every single *producing* lease. Having appraised the well and its supporting acreage, the remaining acreage in the lease should be given a percentage of probability of becoming productive. The value of the productive acreage as acreage multiplied by this probability and less deduction for reduction of pressure because

of deferment of drilling and risk, as conditions may warrant, give us a value for this remaining portion of the lease.

Non-producing leases may be reported under one head, undeveloped acreage, as a more detailed classification would be of no consequence to the Department as it cannot enter capital sum until producing.

Our next step is to calculate the value of the physical properties as of the date of appraisal. If installed prior to 1913 its original cost must be depreciated to a 1913 basis. The rate of depreciation of the well equipment should be calculated on a straight line for the estimated life of the well.

The fair exchange value of the whole property must now have deducted from it the value of the physical property as of the date of appraisal. This value of physical property constitutes the depreciable capital sum after subtracting a percentage equivalent to the eventual salvage. The fair exchange value less the cost of the physical property is the depletable capital sum and represents value attributed solely to the gas in the ground. It in turn, however, should be divided into three parts, one representing the cost of the gas reserve, one that of drilling and exploration, earnings on both of which are merely a return of capital and the remaining portion of the value the earnings from which are on an appreciation shown by the appraisal over cost so that such earnings can be transferred to surplus and increase the invested capital, provided they are not distributed as dividends.

We now have the amount which is to be taken as depletion and depreciation allowance through the years in proportion to which depreciation and depletion is sustained. It remains to ascertain the rate at which the depletion allowances are to be taken for use in Schedule V on Depletion, and that not from 1913, but because also used in depletion of invested capital prior to 1913, from the drilling of the first well. To do this, one must first get the estimated future recoverable reserve of gas as of the date of completion. This is a technical procedure for which the reader is referred to Bulletin 177, Bureau of Mines and the foregoing paragraphs on appraisal.

The salvage value received in the terminal year is a further deduction from income of that year since it is a return of capital.

The rate of depletion is based in the regulations upon the rate of decline in rock pressure. This method was chosen as against yield or capacity because it was known that in the case of many small operators yield or even capacity figures could not be had by pool units and the regulations demand separate computation by pool units or, if not feasible, geographical districts. It is expressly stated, however, that depletion need not necessarily be worked on a rock pressure basis if there can be shown good reasons why any other method would give a better result. There are two circumstances where rock pressure decline is not adequate. The first is where water has been encroaching. Obviously, if the volume occupied by the gas had been contracting as the result of the encroachment of water, the pressure will not go down as rapidly although the depletion may have been as great. It is for this reason that it is very important to keep a history of the water in every gas pool, so that if water is encroaching, a more rapid depletion can be obtained than would be shown in the rock pressure curves. The correction varies with the proportionate volume of the sand flooded.

A second circumstance, where rock pressure decline is alone inadequate is where a pool has been pulled upon rapidly one year, and the next year for some reason, such as a new gas pool coming in elsewhere or because of a partially mild season, or desire to use it in part as reserve, it is pulled upon less rapidly. It not infrequently happens under such circumstances, that there is an actual gain in rock pressure and there may even be an actual gain in capacity. It is clear that depletion is to be claimed in these years if gas was actually taken from the well even though there has been a gain in the apparent condition of the well. This may be calculated by using an actual yield curve instead of rock pressure if that can be obtained, or if that is not possible then we must recompute the depletions so that some is shown in each year and the whole amount is determined from initial to last pressure is allocated to the years mainly on the basis of the extent to which the wells were known to be drawn upon.

The construction of the curve for ascertaining the rate of depletion is essentially like that of curves for appraisal, except that in appraisal the curves must be one of yield and the valuation is set up once for all, and no information subsequent to the date of appraisal can be utilized. Whereas in making out the depletion rate rock pressure, yield or other index may be used. All the data is utilizable and revision from year to year is permissible and indeed desired in the Regulations.

The question of what the economic limit, i. e., how small a well must be before it must be abandoned is a matter to be determined for each field recognizing that it will become regularly lower in the future.

While the depreciable capital sum in so far as represented by well equipment should be depreciated on a straight line representing the life of the well, this does not apply to other features such as pipe lines, marketing facilities, etc., which receives a straight line depreciation set upon that experience has shown to be their probable life which frequently exceeds the life of the wells. We may add each year the money invested in new physical property and also the money spent in new development work, one going into the depreciable capital sum and the other into the depletable capital sum. Cost should always be entered unless the well is such as to permit the use of ascertained value under the Regulations.

The conditions which give the discovery appraisal right are as follows: first, the well must have a value which is disproportionate to the cost. Further, the acres of the reservoir appraised must have been purchased or leased prior to its having become a proven area, and it must not have previously received a discovery appraisal.

The definition of what constitutes a proven area is given by the Regulations as being the 160 acres of that reservoir surrounding the hole in question. From this it follows that a well which strikes gas in a different reservoir altho in the same area from that in which the 160 acres was proven may constitute a discovery. The area to be appraised in case of discovery, is all within "the exterior limit of a continuous tract held under leases or in fee by the taxpayer" which belongs to the lessee and which

is included within this 160 acre square surrounding the discovery well. In the case that the lease has had a former appraisal as of 1913, only the value newly created is to be used.

In appraising a discovery well, one is of course, limited to the knowledge of that date. This involves the use of a different predicted price curve, as of that date rather than that one would have used March 1, 1913. The law permits the appraisal to be of the date of discovery or 30 days thereafter. One should appraise, of course, at the earlier date, unless the value increased during the 30 days, because depletion is most rapid in the first 30 days and is not allowed until a valuation is established on the property. Observe that the unit to be appraised is not only the well and its supporting acreage, but the deposit underlying the acreage of the reservoir extending beyond this, which may in some cases be as much as 160 acres. The Treasury Department will not allow all of this to be appraised as if it were truly proven or 100% probable, although it is legally so called, but rather it will be appraised on the basis of "fair exchange value." To ascertain its fair exchange value one can, of course, fall back on analogous sales as before or else one may assume a percentage value of the inner acreage, which supported the first well, as expressing its probability of being productive. If we allow forty acres to the discovery gas well we would then have 120 additional acres or less for appraisal. The value of the central supporting acres is derived from what it was when newly drilled by subtracting the cost of the material and drilling. The total usually requires a further deduction because of the risk of investment and loss of pressure from deferment of drilling.

If an area is proven for oil, the discovery of the first commercial gas well if commercial as to its gas alone, in this area will give a discovery appraisal for gas if the other conditions are fulfilled.

Where gas has a gasoline value commercial in amount, either by compression or absorption method, a separate value should be placed on this product and it is to be included in both the 1913 and discovery appraisal where it would have been considered by a buyer or seller in arriving at a price at the time of appraisal, but the gasoline is treated as a part of the gas where the well is

a commercial gas well, not as a third product. Where an oil well produces casinghead gas in an amount not sufficient to justify drilling for the casinghead gas alone, it is an oil well with a gas by-product not a "gas well."

INCOME TAX LAW FOR 1917 RETURN

While the income tax law applying to 1918 is worked out on the same basis with differing rates than 1919, the income tax law applying to 1916 and 1917 has one important difference, namely, that the depletion allowance to the lessee is allowed only on cost, not on appraisal value, and that there is no discovery appraisal right. But in the case of the lessor, he may have depletion allowances based as in the law of 1918 with reference to appraisal of March 1, 1913, but not discoveries. Note, however, that discoveries in 1917 and back to March 1, 1913 are permitted for purposes of calculating the tax for 1918 and thereafter.

The laws applying to 1913, 1914, and 1915 grant an allowance for depletion only to an extent of 5%. The law does not permit us to go back and redress this deficiency which is now admitted to be inadequate, and it is necessary to take off a sustained depletion in calculating tax for later years even though it was not allowed at the time. This 5% limit does not apply, moreover, to the depletion of invested capital.

EXCESS PROFITS TAX FOR 1919

In working out the excess profits tax the principal peculiarity of interest in this connection is in the matter of adding surplus. Invested capital is capital actually invested, but where a proportion of the earnings is attributable to capital which is appreciation shown in the appraisal as over cost, then we may add this as surplus to invested capital for the next year, provided it was not distributed as dividends.

In making out net incomes for computing excess profits tax, depletion and depreciation should be deducted. The invested capital itself is also cut down each year by depletion and depreciation although it may also be added to by newly invested capital and additions to surplus.

In summary, gas companies must realize the great amount of labor in merely hunting up the data to fill in Form O and its supporting blanks for each producing lease, entirely aside from the technical matters of establishing proper valuation, recognizing which wells have the discovery right, properly valuating these discoveries and working out the rate of depletion.

The task commands vastly more attention than has heretofore been given to taxation. It should be prepared for throughout the year and should alter methods of management and accounting to make possible the preparation of a report acceptable to the Department.

President Oliphant: Mr. Secretary, do you know of any further business to come before the meeting this afternoon?

Secretary Way: I merely want to say a word on the matter of the annual dinner for Wednesday night. We have made elaborate arrangements and have a banquet room which will seat twelve hundred. It is very necessary for us to know by tomorrow morning just exactly how many we are going to have at the banquet. Usually the delegates and guests at the Convention attend the annual banquet very freely. I know everybody wants to come but I simply want to say to those who are holding back in the matter of purchasing tickets that it is of vital importance we know by tomorrow morning the number of guests who are going to attend our annual dinner. Those who have the dinner in charge must know by that time the extent of preparations to be made in order that the dinner may be served promptly and everything move off as planned.

I am also requested to make the announcement that the Reading Iron Works desire to put on the screen slides illustrating the manufacture of steel and iron by the plant. That will be done in this room immediately following the regular meeting of the Association Wednesday afternoon.

And thereupon, on motion duly seconded, and carried, the Association adjourned until Wednesday, May 19, 1920, at 10 o'clock A. M.

SECOND DAY — MORNING SESSION

WEDNESDAY, MAY 19, 1920.

PRESIDENT OLIPHANT: Gentlemen, please come to order and we will open the second day of the Natural Gas Convention.

The first order of business on today's program is the Report of the Committee on Uniform Accounting, Mr. George W. Ratcliffe, Chairman. Is Mr. Ratcliffe here this morning? If he is not, Mr. Way will read the report as it has been submitted as approved by the Committee.

SECRETARY WAY then read the following:

REPORT OF THE COMMITTEE ON UNIFORM ACCOUNTING

PITTSBURGH, PENNSYLVANIA, APRIL 8TH, 1920.

Mr. President:

At the last anual meeting your Committee on Uniform Accounting reported progress made in connection with arriving at a uniform classification of accounts for adoption by the different regulating authorities, and particularly the results of its negotiations with the Public Service Commissions of Pennsylvania and West Virginia and the Public Utilities Commisson of Ohio.

Since then, conferences and much discussion was had with representatives of the Bureau of Accounts and Statistics of the Public Service Commission of Pennsylvania, and finally your Committee was represented in person and by counsel at a public hearing before the Commissioners, held in the city of Harrisburg, in the month of June, at which time argument was made upon the following points in dispute:

1st — Debt, Discount and Expense.

2nd — Depreciation Reserve.

3rd — Elimination of Intangibles from certain accounts.

4th — Cost against Par only of Reacquired Securities.

5th — Preliminary Survey and Investigation Charges.

6th — Combination of Domestic and Commercial Sales Account.

7th — Capitalization of Well Drilling and Field Line Construction.

8th — Rentals on Unoperated Leases.

9th — Changing Well and Field Line Equipment.

10th — Amortization of Interest in Landed Capital, the Commission finally adopting in July a Classification of Accounts in accordance with your Committee's recommendations as to the foregoing items in the majority of cases.

As printed copies of said Classification were furnished all Pennsylvania Company members and as the subject matter is too voluminous to include herein, it might be well to state that those desiring copies of this Classification of Accounts may procure same by communicating with Mr. Wm. B. Way, Secretary, Pittsburgh, Pennsylvania.

In connection with the cost of Well and Field Line Construction, which, under the Classification, must be charged to Fixed Capital Account, it was the Committee's recommendation that it should be optional with the different companies as to whether or not the actual cost of drilling line construction (that is gathering lines from the wells to the transportation line, which gathering lines would, of course, be removed when the well be charged to Operating Expenses or Fixed Capital, depending upon the peculiar conditions applying to each company, as a majority if not all of the gas companies operating in the eastern fields are drilling additional wells under present conditions, simply in the effort to maintain production to offset, as much as possible, for exhaustion.

In view of the final ruling upon this question in the State of Pennsylvania, we are reluctantly brought to the conclusion that little weight was given your Committee's statements to the effect that eminent men of long experience, familiar with and engaged in the industry, had adopted the procedure of charging these costs to Operating Expenses. As a result, the Commission has only increased the inaccuracy of the records on account of the difficulty of intelligently estimating the life of the wells drilled, and consequently what amount of the cost thereof should be charged off each year as a reserve against exhaustion.

In agreeing with the Bureau of Statistics as to the system of accounts, your Committee assented thereto in the interests

of unanimity, but reserved the right, whenever necessary, to have the question of rates determined by actual facts, when those facts are made to appear, whether they corresponded or not to the accounts kept in accordance with the proposed system.

This scheme of accounts becoming operative in the State of Pennsylvania as of January 1st, 1920, it is obligatory upon all companies operating in the State of Pennsylvania to keep their accounts and records in accordance therewith.

Owing to the delay incident to getting the final decision upon these matters in Pennsylvania, it was impracticable to file suggestions and comments with the proper representative of the Public Utilities Commission of Ohio prior to July 1st, 1919, as proposed, and because of the ruling in Pennsylvania, in regard to the capitalization of Drilling Well and Field Line Construction costs, your committee desired a hearing before the said Ohio Commission so that this question might be properly discussed before its adoption in Ohio.

The Public Utilities Commission of Ohio being already heavily burdened with hearings, a postponement for the effective date of this Classification until January 1st, 1921, was agreed to, so that it will be necessary for the Association to shape its policy relative thereto in the State of Ohio in the near future.

As yet the Public Service Commission of West Virginia has not taken official cognizance of the question of Uniform Classification of Accounts other than by the attendance of its Statistician at the conferences and hearing before the Public Sservice Commission of Pennsylvania, who, we understand, to be in accord with the classification now in effect.

Your Committee has received copies of a tentative Classification of Accounts put out by the American Gas Association asking views as to same from the standpoint of those engaged in the natural gas branch of the industry.

As there is an apparent need for cooperation in this connection, particularly as regards uniformity of records and reports, you deemed it advisable to designate a member of this Committee to represent the Association at conferences with similar committees of the American Gas Association.

In view of the increasing number of reports now being

made by gas and other utilities, the American Gas Association through its Committee on Standard Classification of Accounts, is endeavoring to arrange for the adoption of a standard form of annual reports by the various State Utility Commissions. The rightful scope of such reports is of course determined by the statutes prescribing the powers and duties of the Commissions and while these are not identical in the several states, they are sufficiently in accord to make it practicable to settle on uniform requirements. The experience of the past has shown that many of the requirements of the Commissions are unduly burdensome, and it will be the endeavor to secure modifications thereof and furnish them such data as they need at as little expense to the companies as is practicable.

This question is of equal importance to the natural gas industry as to other utilities and the Association should determine its policy in connection therewith.

Respectfully submitted for the Committee on Uniform Accounting, (Signed) GEORGE W. RATCLIFFE,
Chairman.

PRESIDENT OLIPHANT: Gentlemen, if there is no objection the Report as read will be received, filed and spread upon the minutes of the Association.

The next order of business on the Program is a paper by Mr. Henry L. Doherty of New York on the subject "Service and Conservation under the Three Part Rate." Mr. Doherty is not here this morning but Mr. Hamilton will read the paper for him. It now gives me great pleasure to introduce to you Mr. Hamilton (applause).

MR. F. C. HAMILTON: Mr. President, I would like to make just one preliminary remark. Mr. Doherty wrote his first paper on the "Three Part Rate" before the National Electric Light Association in 1900 and a large part of the current sold by all of the Electric Companies of the United States is billed to consumers on some form or other of demand charge and consumption charge. You know that heretofore has not been used in the gas business except in a very minor manner.

MR. HAMILTON then read, as prepared by Mr. Henry L. Doherty of New York, the following paper:

RESULTS UNDER THE THREE-PART RATE AT OTTAWA, KANSAS

BY HENRY L. DOHERTY.

Since some of the data which follows was obtained in Ottawa, Kansas, where the Three-Part Rate is in effect, it may be well to summarize here some of the facts in connection with that installation.

Ottawa, prior to the installation of this rate, was being served by the Ottawa Gas and Electric Company with natural gas at a straight meter rate of eighty cents per thousand cubic feet. The Three-Part Rate, which was substituted as of January 1st for the straight meter rate previously in effect, consists of

A Customer Charge of $9.00 per year per customer, payable in equal monthly instalments;

A Demand Charge of 32 cents per year per foot of maximum hourly demand, payable in equal monthly instalments; and

A Consumption Charge of 40 cents per thousand cubic feet of gas consumed.

After the adjustment of his appliances, each customer chose such a maximum demand as, with the advice of the company's service department, he determined was necessary to supply his needs. There was installed on his service an Empire limiting meter which restricts the flow of gas to a point that the customer in one hour secures only that number of feet of gas for which he pays a maximum demand. These limiting meters are made in various sizes and were installed as follows:

LIMITING METERS INSTALLED AT OTTAWA, KANSAS

Capacity Limiting Meters Feet Per Hour	*Number of Customers*	*Per Cent. of Total Customers*	*Cumulative Per Cent.*	*Total Demand Cubic Feet*
22.5	88	4.5	4.5	1980
30	163	8.3	12.8	4890
37.5	283	14.4	27.2	10612.5
45	477	24.3	51.5	21645
50	3	.2	51.7	150
52.5	184	9.4	61.1	9660
60	234	11.9	73.0	14040
67.5	88	4.5	77.5	5940
75	149	7.6	85.1	11175
82.5	31	1.6	86.7	2557.5
90	90	4.6	91.3	8100
97.5	8	.4	91.7	780
105	47	2.4	94.1	4935
112.5	1	.05	94.15	112.5
120	55	2.8	96.95	6600
127.5	3	.15	97.1	382.5
135	2	.1	97.2	270
142.5	2	.1	97.3	285
150	22	1.1	98.4	3300
157.5	2	.1	98.5	315
165	3	.15	98.65	495
180	3	.15	98.8	540
202.5	1	.05	98.85	202.5
210	11	.55	99.4	2310
225	1	.05	99.45	225
240	3	.15	99.6	720
250	2	.1	99.7	500
300	4	.2	99.9	1200
360	1	.05	99.95	360
400	1	.05	100.0	400
Total	1962	100.00		114502.5

As one result of the installation there was a fifty per cent. cut in the maximum possible demand on the lines of the Ottawa Gas and Electric Company in any given hour.

The average rate at which gas was sold in Ottawa of eighty cents per thousand cubic feet was reduced to approximately seventy-five cents per thousand cubic feet.

The contract which the customer will sign in Ottawa, and by which he agrees to pay a certain demand charge per year, will guarantee that demand to him at any time he may desire it within that year. Failure of the company to deliver that amount of gas at any time the customer may desire it will entitle the customer to a rebate of ten times the demand charge for the period and proportion of such failure.

The reduction of leakage that can be made without the expenditure of anything for main repairs will amount to about thirty per cent. This follows the installation of the limiting meters on the services of the customers, reducing their maximum demands and thereby reducing the pressure that it is necessary to carry in the mains.

THE REQUISITE OF A PROPER RATE.

From the standpoint of equity, the rate must distribute all of the costs of service between individual customers in direct proportion to their responsibility for those costs.

From the standpoint of public policy, a proper rate must penalize extravagant and wasteful uses of gas and put a premium on its efficient utilization, while under the law the rates must be non-discriminatory.

From the standpoint of continuation of service the rates in effect must allowed the company an adequate revenue to properly maintain its operating department and an adequate and efficient plant.

I believe that the Three-Part Rate fulfills all of those conditions.

BASIS OF THE THREE-PART RATE

There are in this rate three separate and distinct charges referred to respectively as Customer Charge, Demand Charge and Consumption Charge.

Under the Customer Charge there are distributed equally to each customer those expenses which bear no relation to his maxi-

mum demand in a given hour or to his total consumption in the year. Under this heading fall the cost of meter reading, bookkeeping, labor, postage and stationery necessary to render bills; the expenses of the cashier's department; meter testing department, and fixed charges on that portion of the investment which is proportional to the number of customers on the system irrespective of their demands. The total of these expenses for a company having 10,000 customers will be practically twice that of the company having 5,000 customers and, therefore, should be proportionate to and distributed equally among the number of customers connected.

Under the Demand Charge there are distributed to each customer, in proportion to his maximum hourly demand, those fixed charges on that portion of the investment which does vary with the maximum demand placed on the system.

The two chief factors which determine the size of the investment of a particular company are: 1st; The number of customers; and, 2nd: The maximum demand that those customers place on the lines at any given time.

Our organization at one time had offered to them by-product coke oven gas, and we had two options as to where we would sell it. One of them was to a town in which we estimated we could get about 10,000 domestic consumers, and the other was a small group of industrial concerns. Either one would absorb all the gas we had available and their load characteristics were very similar. To supply 10,000 customers at 50 customers per mile would require 200 miles of street mains. These, at $5,000 a mile, would cost $1,000,000. In addition we would have to set 10,000 meters at about $15.00 each, or $150,000 more, making a total of $1,150,000. If we supplied the industrial customers we would only have to supply a mile or two of pipe and a few large meters, making a total investment of considerably less than $100,000.

The difference in these two cases then is the difference in the number of customers, of about 9,990, and a difference in investment of about a million dollars. In other words, those 9,990 additional customers required investments of over $100.00 apiece. Interest, depreciation, maintenance, taxes, etc., at 10

per cent. means an annual charge per customer of $10.00. To this we must add the collection expense and a portion of the general expenses, which would be about $4.00 or $5.00 a year, making a total cost of $14.00 per domestic customer.

You will say that this figure includes in the distribution system provision for demand, but the same is true for the industrial customers. The demand is the same in both cases, the only difference being the number of customers. In other words, it costs us $14,000 a year solely because we must deliver this gas to 10,000 places on 200 miles of street, instead of to only one or two places on four or five miles of street.

The size of the transmission lines is, of course dependent on the size of the maximum demand irrespective of whether that maximum demand is occasioned by supplying one customer or 10,000 customers. The fixed charges on that investment, the size of which is determined by the maximum demand, are distributed to each customer as a Demand Charge. The Demand Charge is uniform for equal demands and proportional to the demands. This is irrespective of the fact that one customer with a fifty cubic foot demand may utilize his demand four times as long as does a customer with a one hundred cubic foot demand, and, therefore, may in a day or a year use twice the amount of gas.

It is clear that neither the customer expense nor the demand expense, forced on the company for service to a particular customer bears any relation whatever to the total amount of gas which that customer may use in a month or a year.

Under the Consumption Charge there are billed to each customer those expenses which vary directly with the amount of gas which the company must supply and these charges are billed to each customer directly in proportion to the amount of gas he consumes. As was pointed out in the paragraph on the Demand Charge, the customer with a fifty cubic foot demand may use twice as much gas in a given month or a year as the customer with a one hundred cubic foot an hour demand.

The total cost to the company for gas alone would be identical whether they supply one customer using ten million cubic feet, ten customers each using one million cubic feet, or one thousand customers each using ten thousand cubic feet.

We have three distinct classes of cost, each of which varies with a factor that does not influence either of the other two classes. Under the Three-Part Rate each customer is billed with each class of expense in proportion as he makes that cost necessary.

CONSERVATION

The conservation of gas that follows the installation of the Three-Part Rate is divided into two general divisions:

First. Since the largest saving to be effected is in the homes of the customers, the gas companies have been pointing out to the public the necessity for the conservation of gas. Various branches of the Federal and state governments have been printing booklets and utilizing the press to reach the public *without any appreciable effect.*

It is my conviction that until such time as the customer appreciates he is directly interested in gas conservation *no progress will be made.* In the installation of the Three-Part Rate this direct financial interest of the customer is brought to his attention at once when he realizes that he must pay a monthly premium unless he uses the gas in efficient appliances, properly adjusted.

There is available to him under the Three-Part Rate any sized demand which he may care to take and his demand charge is proportionate to any maximum demand he chooses. Exhibits of appliances and their varying demands indicate to him the amount of the premium he must pay for the continued use of an inefficient appliance and he at once will have his appliances adjusted if that will lower his demand charge, or he will supplant the inefficient with efficient appliances if that be necessary.

In our various surveys we find cooking ranges burning as high as 106 cubic feet per hour while we have found it practicable to cook meals for twenty people with a demand of 30 cubic feet per hour on identical appliances *properly adjusted.*

Under the Three-Part Rate, as installed at Ottawa, Kansas, the difference in the annual demand charge between those two cooking ranges, one properly and one improperly adjusted, would be $24.32.

The customer also learns the saving which he would make in the consumption charge under the change in efficiency.

We have not through publicity in the past received the co-operation of the public, but there can be no question that when a customer is told he has to pay $24.00 per year for the privilege of using an improperly adjusted range, he will at once have that range adjusted.

The effect of this can best be appreciated when you consider that the average demand per customer of 1962 customers in Ottawa, prior to the time their appliances were adjusted, was 118 cubic feet per hour; that at the present time with the limiting meters, installed in November, December and January, the total maximum demand that can be placed on the system by these same 1962 customers is 114,502 cubic feet, which gives an average of 58.4 cubic feet per customer.

This does not mean that the customers had the service, which they previously received, reduced. In fact many of these customers are getting more service at the present time than they had prior to the adjustment of their appliances, for the simple reason that under the flat eighty cent rate they could not afford to do any house heating. They now do considerable incidental heating which comes within the capacity of their demand limiting meters, for which their additional cost, over and above the cost of their other service, is only the additional forty cents per thousand cubic feet which they have to pay as a consumption charge.

The effect on the service, from the standpoint of the company, can be realized when a comparison is made of the present maximum demand of 114,502 cubic feet with the maximum demand under the old conditions of 231,516 cubic feet in a given hour. This city at the present time has a gas service superior to anything it has heretofore experienced and at the same time the company is supplying that service with less than half of the maximum demand previously made on its lines.

Housewives find that they can boil water more quickly; that their pots and pans are not blackened as they previously were with the improperly adjusted burners. When the summer comes the difference in the temperature of their kitchens will be appreciable because of the fact that the heat necessary to do

their cooking is applied to the cooking utensils without a great surplus being radiated into the room, as was the case with the closed top ranges and long flames necessary before the burners were changed.

Some of the appliances which we found in use while installing the Three-Part Rate in Ottawa were scarcely to be recognized by any but older gas men. For instance, we found star burners, two in a set, which would be inserted in the fire box of an ordinary coal range and which for cooking purposes would take the place of two burners on a regular gas range. These star burners used 450 cubic feet of gas per hour, and under the Ottawa rate the demand charge alone on such a burner would be $144.00 per year. Needless to say they are no longer in use. These star burners were cheap from the standpoint of their original cost but the consumer paid for them many times burning gas at an eighty cent rate. Gas companies will find that the source of much of the feeling against them originates in devices like the star burner which increase the consumer's bill disproportionately to the service rendered.

There is a picture in the booth of Henry L. Doherty & Company of another interesting appliance which we found and which has a demand of approximately 250 cubic feet of gas per hour. The appliance has not been named as yet, but consists of a piece of gas pipe, about four and one-half feet in length with holes drilled in it, placed about four inches below a bath-tub. The flames from this homemade burner impinged directly on the bottom of the bath-tub.

These two examples are striking it is true but of little importance because of their rarity.

The real conservation that was effected was in the adjustment of otherwise efficient equipment and the resulting reduction in the gas consumption.

Meritorious as the objects back of the propaganda for the conservation of gas may be, it is my firm conviction, as it is the conviction of all the men who had anything to do with the installation of the Three-Part Rate at Ottawa, that so far propaganda has had no particular effect upon the public mind. I doubt whether continuation of that propaganda, without the

installation of a proper rate, will postpone the death of the natural gas business.

Second. We come now to another item of conservation, which, while not so large as is possible in the homes, is large enough to have a marked effect on the earnings of the distributing company and on the continuation of the natural gas service.

It will be appreciated at once that the pressure in the distribution mains to supply the present Ottawa demand of 114,000 cubic feet per hour is much lower than that needed for the demand of 231,500 cubic feet necessary under the old conditions.

Leakage is the best customer from the standpoint of load factor the gas company has, but unfortunately does not produce any revenue. It is present twenty-four hours a day and varies in relation to the pressure in the mains. A great reduction in this leakage is at once apparent when the conditions under which the customers use gas are so changed as to enable a reduction in the distributing pressure.

We believe that in Ottawa where we have in the past had maximum pressures of from 9 to 12 ounces, it will be possible with the reduced demands to distribute the necessary gas with a maximum pressure of 4 ounces. The saving in leakage by this reduction will be effected without any expenditure in main repairs and without any reduction in the quality of service.

ADVANTAGES OF RATES WHEN SUPPLY DECLINES

Undoubtedly the conservation that can be effected in the homes of the customers and in the mains of the distributing companies by the installation of the Three-Part Rate will greatly lengthen the life of the gas fields. It is nevertheless true that there is an artificial death date to the natural gas business that we are rapidly approaching.

With a continuation of the present straight meter rates, when the time comes that a company is no longer able to supply all of its customers, it will be necessary to pick out certain groups and entirely discontinue service to them, in order to better the service to the remaining customers.

With the Three-Part Rate in effect we would know the maximum demand to which each customer was limited and it would be practicable and easy for the proper regulatory body to decrease the maximum demand of each customer ten per cent., for instance, by having installed limiting meters of smaller capacity. This would seem to be a much fairer method of bringing the demand on the gas company within its supply than would the method of discontinuing the service to some particular group.

Beyond the question of a doubt the remaining customers would decline to pay fixed charges on that portion of the property which had been scrapped and would decline to amortize that portion of the property from which they never had had and never would have any service.

The proportionate reduction of service would, as long as it was practicable, permit the use of gas to more people for those services where coal and other fuels stand the least possibility of competing on an economic basis. If conservation means anything it means the utilization of the least expensive and most efficient fuel for any particular operation.

If discrimination means anything it would, to my mind, be applicable when gas customers on the North side of a particular town were asked to discontinue the use of a 1,000 B. t. u. gas at, we will say, $1.00 per thousand cubic feet, and begin using a 525 B. t. u. gas at $1.50 per thousand cubic feet for the purposes of making good service available to the customers on the South side of town.

DISCRIMINATION IN SERVICE UNDER STRAIGHT METER RATE

Under the present straight meter rate, we have conditions whereby a customer is discriminated against because of the location of his house.

The usual natural gas towns are belted with an intermediate pressure main from which the distributing system is fed. In the ordinary town the better residences are built on the outskirts of the town. The better class of residence presupposes on the part of the owners a financial ability to buy any number of appliances they may desire. The smaller homes and flats, which

on the average are occupied by people with lesser incomes, are, therefore, necessarily located farther from the intermediate lines. With the unlimited demands, present wherever straight meter rates are in use, it is impossible for the gas company to supply adequate service on cold mornings because either the gas supply or the carrying capacity of the mains is insufficient.

When the pressure begins to drop on one of these cold mornings the natural inclination is to light more appliances, with the result that the available gas went to those customers with the most appliances because of the fact that their homes naturally were located nearest to the intermediate lines.

During the extremely cold weather we have had days at a time in Wichita, Kansas, when there was no gas in the poorer homes and where some of the better residences were using from 500 to 1,500 cubic feet of gas per hour for house heating with inefficient appliances.

At the same time these larger residences throughout the year do not use a proportionately greater amount of gas. The occupants of these homes go to Florida or California after the Christmas holidays and spend a large portion of the summer in Colorado.

If there had been a real need for the curtailment of service, the curtailment certainly should have been pro-rated. However, there was no need of a curtailment of service; all that was necessary was a rate which would force the installation of efficient appliances. In one of the houses, for instance, we found appliances which, in the condition we found them, necessitated a maximum demand of 2,500 cubic feet per hour. During the short time that these appliances were all in use the owner of the home was amply able to pay for whatever gas was used at any reasonable straight meter rate. Under the Three-Part Rate his annual demand charge alone would have been $800.00 per year, and being perfectly able to buy efficient appliances the changes which we suggested could have been effected at once and all of the service which he had previously received could have been supplied wth a demand of 250 cubic feet. This would have made 2,250 cubic feet per hour available to smaller consumers on those

cold mornings and would have been sufficient to have operated 75 properly adjusted kitchen ranges.

This consumer, without doubt, believes in conservation as a theory, but until its practical application was forced to his attention no progress had been made, and *the authority which permits a straight meter rate to continue is discriminating against the very class they call the small consumer* and whom they have every desire to protect.

I have cited one particularly bad case. I could, if space permitted, list hundreds.

ADVANCE INFORMATION OF MAXIMUM DEMANDS

Most natural gas companies have been most bitterly denounced by their customers for their lack of service on cold winter days. The customer does not know, and never will understand, why it is on the cold days especially that the service is inadequate.

Our service contracts under the Three-Part Rate run for one year, as is usual with most utilities, and at any time we can tell the maximum amount of gas we can possibly be asked to supply in a given hour *within the year to come*. We can decline to sign up contracts for additional supplies when we have reached the limit of our capacity. We can apply to the commission for a pro-rata curtailment of the present contracts whenever the necessity for that move becomes apparent.

We, therefore, can keep the demands on us within our capacity and can guarantee that these demands for which we have contracts will be supplied with gas not only on the 4th of July but on the 1st of January.

I need not before the members of the Natural Gas Association dwell on the benefits of such a situation.

EFFECT ON APPLIANCES

In the preceding paragraph, I have made reference to two particular appliances, the star burner and a bath-tub heater, the continued manufacture of which ought not to be encouraged.

We found in the installation of the Three-Part Rate that we had to educate the owners of hardware stores, plumbing establishments and department stores on the subject of gas conservation. We found many of these people thoroughly imbued with the idea that it was unhealthy and impracticable to use ranges with spider tops and short flames. Appliance salesmen selling the other type of appliances had created this atmosphere and it had to be overcome before we could get the co-operation of these people.

It is obvious that many types of appliances that inefficiently use gas can be manufactured at a lower price than can a more carefully designed and built appliance which gives a greater efficiency. The first interest of the customer is in the original price of his appliance and the conservation propaganda starts out with this very decided handicap.

Under the Three-Part Rate, however, the additional cost of an inefficient appliance is brought home to the consumer at once, and in the town of Ottawa, where this rate is in effect, it would be hard for the most plausible salesman at the present time to sell them an appliance that was not efficient. This rate practically prohibits the sales of inefficient appliances and certainly puts a premium on the manufacture of others even more efficient than those we now have at our command. Any widespread adoption of this rate will have a tremendous effect on the engineering or research departments of every organization manufacturing appliances, and that recommendation alone ought to take the rate a long way toward adoption.

WHO IS THE SMALL CONSUMER?

Great opposition has been encountered in the past when endeavors have been made to install a rate which contains either a customer charge or a demand charge on the basis that these rates unduly penalize the small consumer. This opposition on the part of City Councils, Public Utility Commissions and other regulatory bodies has been based on the mistaken idea that the small consumer is the man in poor circumstances. A slight consideration would convince most any one that this theory is absolutely fallacious.

In which home do you suppose there would naturally be used the most gas in a year? Take first an apartment renting for $100.00 to $125.00 a month. Most apartments prohibit children, so we can exclude children from this family unless the poodle dog is counted. The size of the rent paid indicates that the man must have a fairly lucrative position and pre-supposes that he does not carry his lunch but eats at a restaurant or club down town. It is likely the man of the house belongs to the golf club and it is fair to assume that he has a vacation every year. It is perfectly safe to assume that the wife does not do her own washing or ironing; that the heat is supplied by the owner of the apartment, and that, therefore, the only uses for gas are for a light breakfast, an occasional dinner at home and no luncheon, because a family of two doing little manual labor will probably have light meals.

In a case before the Kansas Commission, this particular type of customer was most aptly classified under the heading of "toast eaters."

As the other example, we have the man doing manual labor, living in a house or flat, usually with a good sized family, all of whom have good appetites. It is safe to assume that if he is paying a rent not to exceed $50.00 a month, he has to furnish his own heat and that his wife does her own laundry work; that he does carry his lunch, and that, therefore, there must be prepared the equivalent of three square meals a day, together with the heating of a considerable quantity of water. In all reasonableness which do you assume would be the larger gas consumer of these two homes.

You need not depend on theory because for the year ending June 1st, 1916, there was a survey made of hundreds of customers in Kansas City, Missouri, with the idea of determining what monthly rent these customers paid and what their average annual gas bills might be.

It was found that in 444 homes, principally flats and two apartment buildings, which had an average monthly rental of $24.77, the average annual gas bill was $25.74. For these people who had to furnish their own heat and without doubt did their

own laundry work, their average annual gas bill was approximately equal to one month's rent.

An analysis was then made of 1123 apartments which rent on an average for $39.72 per month, and it was found that the average annual gas bill was $14.08. Included in this latter group there were 275 apartments that had an average monthly rental of $56.26 and for this group the average annual gas bill was only $12.72. In the two latter classes undoubtedly the laundry work was done outside of the home, and in the majority of cases hot water was furnished by the apartment owners, so that these customers used gas only for cooking purposes.

The gross revenue for the two latter groups could not have exceeded the actual customer's expenses that service to them necessitated on the part of the company, and which under the Three-Part Rate are grouped under the heading of "Customer Charge."

The fixed charges on the investment made necessary by the maximum demands of these customers and the actual gas supplied to them was either a gratuity on the part of the company or on the part of that class of customers, which the regulating bodies have in mind when they say "the working men", or the small consumer.

Because of the straight meter rate under which this service was being rendered these people, who could amply afford to pay the cost of service rendered to them, were nothing more than "charity patients". Under the Three-Part Rate they would of necessity have paid all of the costs which service to them entailed on the part of the company.

THE THREE-PART RATE IN THE ELECTRIC BUSINESS

In consideration of the results that may reasonably be expected from the adoption of the Three-Part method of charging for gas, I believe it would be worth while to consider the comparative condition of the artificial gas plants and the electric plants in ths country.

It is a matter of general knowledge that the great majority of artificial gas plants are unprofitable while the great majority

of electric plants are profitable. In analyzing the situation it would be well to see what fundamental difference there is between these two classes of business.

First. They both sell a manufactured product.

Second. They are both regulated monopolies.

Third. In a given town the artificial gas plant will have more customers than will the electric plant, so that from the standpoint of the number of possible customers the gas business is most favorably situated.

Fourth. Without question the great majority of customers in a given town if told they could have only one of the two services, would discontinue the use of electricity and continue the gas service, so that from the standpoint of comparative desirability the artificial gas plant has the preference.

The only fundamental difference between the two businesses that can account in any way for the difference in their financial condition is their method of charging for service.

At the present time at least seventy-five per cent of the electric current generated and sold in the United States is sold under some form of rate which takes into consideration the maximum demand which the customer places on the plant as one of the items on which to base a charge, and his total consumption of electric energy as another item.

Up to date, however, the artificial gas business has continued to maintain the old straight meter rate for charging, in which the total charge rendered to the consumer was based on only one factor of the service, that being the total consumption.

In a preceding paragraph I have called attention to the apartments in Kansas City where obviously many customers were getting service at less than actual cost of reading the meters, rendering the bills and collecting the accounts. Where only a straight meter rate is in vogue the loss sustained by reason of the service rendered to this class of customers must necessarily be added to the actual cost of serving other customers thus making the good customers pay a premium for their service over and above their fair share of the cost.

The old straight meter charge naturally invites unattractive business and in proportion as it attracts unprofitable business it raises the rate which all must pay and discourages business from which a profit could be made. No industry can expect to succeed with such a program.

The Three-Part Rate, however, in that it charges to each customer exactly the cost which service to that customer entails on the part of the company, naturally attracts more and more business from those customers to whom service can profitably be rendered at a low price per unit. Providing the unprofitable customers continue to use service subsequent to the installation of the Three-Part Rate, they have at least to pay the cost of rendering that service, and are, therefore, not a detriment to the company. Inasmuch as the psychological effect of a fixed charge which the customers must pay any way inclines them to use additional gas after having paid the fixed charges for their class of service, it tends to make good customers out of those who have heretofore been unprofitable.

There is no reason which I can see that would not make the gas business even more profitable than the electric business, providing they adopt the same form of rate schedule which the electric business has had in force for many years. The additional business that has been attracted to the electric companies, the rapid growth of those companies and the introduction of electricity in place of other power has been induced by the form of rate which has been in vogue. The progress that can be made by the gas companies will parallel that made by the electric plants in the last fifteen years.

FINANCIAL CONSIDERATIONS

The crying need of public utilities at the present time is sufficient credit to enable them to obtain money necessary for improvements and extensions. A company operating under the Three-Part Rate will, in my opinion, be a better credit risk for the following reasons: —

First. No organization can afford to carry a sufficient number of high class men to make a careful analysis of the con-

ditions under which service will be used by each individual customer who applies to it for service. Under the straight meter rate such an analysis of each application would be necessary to determine whether or not a new customer's business would or would not prove desirable. Under the Three-Part Rate this analysis is made once for all and investors providing funds for extensions to take care of additional customers, who are to be billed under the Three-Part Rate, have the assurance in advance that the company is taking on business on which they will *not* show a loss.

Second. Nearly all of the fixed charges and a considerable portion of the operating expenses are uniform from month to month. The principal variation in the cost of operation of a natural gas property is the total cost of gas, which runs much higher in winter than summer. Under a straight meter rate the company shows a disproportionate amount of revenue above operating expenses in the winter months and quite often shows a deficit below operating expenses in the summer months. Under the Three-Part Rate the fixed charges being provided for in the revenue secured from the Customer Charge and the Demand Charge, the total revenue follows these expenditures up and down month by month. The Consumption Charge furnishes the revenue to pay for the gas and varies in proportion as the gas purchased by the company must vary.

Third. The conservation of gas which follows the installation of the Three-Part Rate tends to add permanency to any investment in the natural gas business, and, therefore, has a very desirable effect on the credit of the natural gas company operating under that rate.

Fourth. A properly devised Three-Part Rate with a consumption charge based on the B. t. u. delivered rather than on the cubic feet of gas delivered makes it very easy to substitute a mixed or an artificial gas for natural gas as that necessity arises. This substitution can be made without any radical rate revision and with assurance to the investors who must furnish the money for the artificial gas manufacturing plant that the revenue will provide for the fixed charges on the additional investment.

CONCLUSION

The Three-Part Rate by its very nature accomplishes the following: —

First. Guarantees the customer that amount of gas for which he contracts, for every hour in the year, and makes it possible for the company to fulfil that guarantee.

Second. Conserves large amounts of gas by financially interesting each customer in adjusting his appliances to efficiently utilize gas.

Third. Conserves large amounts of gas by reducing the maximum demands of the customers so as to permit the company to supply these demands with much lower pressures in the distribution mains, thereby reducing the present leakage.

Fourth. It not only distributes the total cost of gas service to the customers as a group, but makes an equitable distribution of this cost as between individual customers.

Fifth. By conserving the *present supply,* and by making the same service possible with a smaller supply of gas, postpones the date when service must be curtailed due to the decline in the fields.

Sixth. Makes possible a pro-rata curtailment of service to all of the present customers instead of making it necessary to entirely discontinue the service to some customers when curtailment becomes necessary.

Seventh. Does away with the present discrimination on cold mornings whereby those customers nearest the supply lines use wasteful amounts while other customers do without any gas.

Eighth. Permits the company to know for months in advance the maximum amount of gas it can be called upon to supply in any peak hour.

Ninth. Puts a premium on the manufacture and use of efficient devices and holds out a prize for the invention of devices using smaller maximum demands.

Tenth. Makes a better credit risk of any company which adopts it in place of a straight meter rate.

After the applause had subsided, following the reading of the above paper, President Oliphant then said:

Gentlemen, you have listened to a most excellent paper prepared by Mr. Doherty and read by Mr. Hamilton. Mr. Hamilton has very kindly consented to enter into a discussion with you or to answer any questions that may be asked him.

MR. HERBERT R. DAVIS: Mr. Hamilton stated that the hourly demand in Ottawa has been reduced by about one-half and I would like to ask Mr. Hamilton if he is in a position to state the total sales in Ottawa or what proportion that bears to the total sales in the year.

MR. HAMILTON: We have not had a full year but we assume that the sales in Ottawa are going to be increased quite considerably. They have had in effect there for some time a straight meter rate of eighty cents per thousand cubic feet and prior to about a year ago very poor service. It was not dependable and they did not depend upon it. Now, we are giving them good service and guaranteeing it and we think it is going to increase the volume somewhat in addition to cutting down the individual demand.

MR. DAVIS: Then this rate has the effect of following your peaks?

MR. HAMILTON: Yes, and gives us a better load factor by far.

MR. J. A. RICHIE: I would like to ask Mr. Hamilton how the plan, as suggested by Mr. Doherty, compares with the step-up rate now being used to some extent in Ohio.

MR. HAMILTON: I have not studied the effect of these step-up rates in Ohio, but it would seem reasonable to believe that when it is twenty degrees below zero nobody is going to stop to consider whether he is going to run over into the block that costs him ten cents a thousand more or not. He will probably give that consideration on some of the mild days when he has got plenty of gas and not give it any consideration on those days when it is or ought to be possible to hammer down his maximum demand. In other words, I think it will give a poorer load factor. It will leave you the same peak you have got now

but curtail your consumption and curtail it on days when you could deliver it instead of on days when you cannot.

PRESIDENT OLIPHANT: Any further discussion, gentlemen? If not we will proceed to the next paper. We thank you very kindly Mr. Hamilton, and Mr. Doherty also for the instructive and valuable paper on this all important subject.

The next order of business this morning is a paper by Mr. C. J. Ramsburg on the subject "The By-Product Coke Oven in Relation to Natural Gas Supply." Gentlemen, we are going to have a moving picture illustration of Mr. Ramsburg's paper. I do not know whether some of you who are seated to the left can see the screen or not and therefore I suggest if you will move over on this side I think you will be better pleased. I now have the pleasure of presenting to you Mr. Ramsburg (applause).

MR. C. J. RAMSBURG: If I attempt to read all of this paper it will take considerable time; I am simply going to read some of the salient features of the paper and then proceed to show some slides upon the screen to illustrate what a By-Product Coke Oven looks like so that when you see the moving picture you will know what it is all about. I hope during the course of my remarks explanatory of the slides you will all feel perfectly free to interrupt me at any time and ask any questions that you desire to ask because the object of it all is for you to understand what a by-product coke oven is; what it can do, and not simply present the paper without further explanation illustrative of the main features of the paper by the slides.

MR. C. J. RAMSBURG then presented the following paper:

THE BY-PRODUCT COKE OVEN IN RELATION TO NATURAL GAS SUPPLY

Prepared jointly by

C. J. RAMSBURG, F. W. SPERR, JR., AND JOSEPH BECKER,
THE KOPPERS COMPANY, PITTSBURGH, PA.

It is the purpose of this paper to point out some of the opportunities afforded by the by-product coke industry in the way of supplementing our natural gas supply. Some of these opportunities have existed for a number of years, but are greatly increasing in importance on account of the rapid growth of the industry; others arise from recent technical developments, and all deserve careful consideration in view of the increasing shortage of natural gas in many districts. The conditions and seriousness of this shortage are too familiar to require description here. They have been created not only by exhaustion of natural gas in districts that owe an important part of their industrial development to the availability of this valuable fuel, but they are due also to inadequacy of supply in proportion to demand in a number of districts where the supply has even greatly increased. The situation is such as to demand the utilization of every possible economical means of augmenting the supply of natural gas. Much of the realization of the advantages of gas as industrial and domestic fuel has come through the exploitation of our natural gas resources. Any relapse to the use of the more wasteful types of fuel would be a serious economic mistake. The maintenance and development of the use of gas are essential from the standpoint of conservation of natural resources, apart from all other considerations.

The supplementing of natural gas with high grade artificial gas should be considered apart from the use of low grade gases, such as producer gas, which, if used in large quantities, produce mixtures of relatively low heating value. The low grade gases

are such as cannot be used alone without extensive modifications of the appliances in which they are consumed. We shall not, at present, give further attention to the use of these low grade gases, but shall proceed with a discussion of the high grade gases which include coke oven gas.

Of the high grade artificial gases available with present methods of manufacture, only two, viz., coal gas and carburetted water gas, deserve serious consideration in this connection. A very important factor in the cost of carburetted water gas is the price of gas oil, and this has increased to such an extent as to make any large scale competition of carburetted water gas with coal gas out of the question. Moreover, we are beginning to face a condition of oil shortage quite analogous to our natural gas shortage. This condition is seriously embarrassing the manufacture of carburetted water gas in many plants and has already led to the erection of a number of coal gas plants.

The typical apparatus for the manufacture of coal gas is the gas retort, in which relatively small charges of coal are heated to high temperatures, primarily for the sake of the gaseous product; the coke residue, and the by-products being of relatively minor importance. This method of manufacture was introduced over 100 years ago and is still extensively employed. However, with the introduction and development of the by-product coke oven, which occurred many years later, it was soon realized that this, if properly designed, constituted an apparatus not only adapted for the manufacture of metallurgical coke, which was its primary purpose, but also capable of furnishing a high grade gas — just as truly "coal gas" as that manufactured in the gas retort. The credit for this realization and its commercial development is very largely due to American enterprise.

It may be of interest to state briefly the advantages of the by-product coke oven over the gas retort for the large scale manufacture of coal gas.

1. The quality of the gas produced is equal, if not superior, to that of the gas retort.
2. The coke is of superior quality and commands a better price and wider market.

3. There are the following advantages with relation to the by-products.
   (A) The yield of ammonia from the same coal is greater.
   (B) The quality of the tar is better especially with respect to higher content of oils and lower percentage of free carbon, except possibly in comparison with the vertical retort.
   (C) The yield of benzols is greater.
4. The coal and coke are handled mechanically in relatively large masses. This results in great economy in labor in comparison with gas retort operation, which, in many cases, requires much hand labor of a particularly arduous and unpleasant character. Where mechanical handling machinery and other labor saving devices are installed in the retort house, the items of interest, depreciation, and repairs are excessive in proportion to the tonnage handled.
5. The plant is much more compact and occupies less ground space than the best designed retort plant of equal capacity.
6. The heating efficiency is greater.
7. The life of the plant is longer and repair charges are less.

The first plant of by-product coke ovens built to supply gas for domestic purposes began operation in Boston about twenty years ago. During the subsequent period, the utility of coke oven gas has been so firmly established that no argument is necessary to prove it. The annual consumption of this fuel for domestic and industrial purposes, outside of iron and steel plants and other establishments with which the by-product coke plants are directly connected, is approximately 40,000,000,000 cubic feet, and indications are that this amount will be greatly increased in the next few years. The following cities obtain either all or a large part of their gas supply from by-product coke ovens:

Baltimore, Md.	Milwaukee, Wis.
Boston, Mass.	Newark, N. J.
Camden, N. J.	Providence, R. I.
Detroit, Mich.	St. Louis, Mo.
Indianapolis, Ind.	St. Paul, Minn.
Jersey City, N. J.	Terre Haute, Ind.
Joliet, Ill.	Toledo, Ohio.

Both theory and experience have shown that coke oven gas is better adapted for mixing with natural gas under practical service conditions than is any other artificial gas. Straight purified coke oven gas, stripped of its benzols, and having a heating value of about 560 B. T. U. per cubic foot and a specified gravity of 0.42, will be the most commonly used for this purpose. Assuming the use of such a gas, the following points should be specially noted:

1. As compared with the low grade gases, the heating value of the coke oven gas is relatively high. Thus small variations in the composition of the mixture, occasioned by variations in the rate of flow of the two gases at the point of mixing, have relatively much less effect on the heating value of the mixture and, therefore, occasion much less inconvenience and loss of efficiency at the point of consumption.
2. In comparison with low grade gases, the coke oven gas has a much lower specific gravity. The investment and power required for conveying a given number of heat units in the form of coke oven gas are much less than in the case of a low grade gas.
3. The cost of removing sulphur compounds from coke oven gas per B. T. U. is much less than in the case of the low grade gases.
4. It should be observed that coke oven gas, properly manufactured, is relatively a dry gas for under practical conditions of compression and distribution, there is no hydrocarbon condensates or loss of heating value. Condensates from other gases have

been found to have an injurious effect on some of the materials used in the meters and other appliances that are commonly used for natural gas.

Of course, in any scheme contemplating the distribution of mixed gases, it is important to maintain fairly constant proportions, so that the consumer may receive a fuel that does not vary so greatly in specific gravity, air requirement, and heating value as to produce loss of efficiency at his burners. The flexibility of coke oven operation is such that the gas can be supplied in the desired proportions for widely varying rates of demand, while actual variations in the proportions added have much less effect than in the case of low grade gases.

Of particular interest in connection with the use of mixtures of coke oven gas and natural gas, is the amount and character of the sulphur compounds present in the former. The amount of sulphur in coke oven gas is considerably less in proportion to the heating value of the gas than in the case of producer gas made from the same coal, and since producer gas is generally made from high sulphur coals, the difference is even more pronounced. Before purification, coke oven gas contains from 300 to 700 grains total sulphur per 100 cu. ft. From 8 to 15 grains of this is in combination with carbon principally as carbon disulphide, while the rest is present as hydrogen sulphide. The first class of sulphur compound is, in this case, insignificant and does not require removal. The hydrogen sulphide is readily removed by the usual method of iron oxide purification that is well established in the illuminating gas industry. Recent developments have indicated the possibility of greatly improving the process of purification in connection with the operation of a by-product coke plant, so as to reduce materially the cost of removing the hydrogen sulphide. In any case, the cost is relatively much lower than that of purifying producer gas.

To those who are familiar with the enormous rate at which natural gas is being produced and consumed, it might seem that any artificial source of supply must be small in comparison; nevertheless, a study of the statistics shows that the present production of by-product coke oven gas and the potential resources

for largely increasing this production are by no means insignificant. Table 1 shows the amount of coal used for making by-product and beehive coke in the United States since 1910. The production in 1919 was abnormally low. It is estimated that the average normal consumption of coal for the manufacture of coke during the next five years will be approximately 86,000,000 net tons per year. If all of this coal were coked in by-product ovens, we should have a gas yield of 10,500 cu. ft. per ton, or a total gas production of 900,000,000,000 cu. ft. of gas per year, which is probably a greater volume than the present annual production of natural gas. This figure represents the maximum possible gas production in conection with coke manufactured at the present average rate. We have not, however, reached the ideal condition when every ton of coke will be made in by-product ovens. Of the 86,000,000 tons of coal used for the manufacture of coke, it may be estimated that, during the next five year period, 46,000,000 tons will be coked per year in by-product ovens, with a total gas production of 480,000,000,000 cu. ft. The waste of gas from beehive ovens will continue at a rate of 420,000,000 cu. ft. per year. Natural gas men, who are quite frequently accused of gross extravagance, may find some comfort in reflecting that the annual waste of good coke oven gas is equivalent in volume to half the annual production of natural gas. Worse still, the bulk of the beehive oven waste occurs in districts that need the gas and could use every cubic foot of it to advantage, while much of the present loss of natural gas occurs on the far away prairies of Kansas, Oklahoma, and Texas.

With assurance of the magnitude of gas production from by-product coke ovens, it is now in order to discuss the various factors affecting this production. These may be grouped under the following heads:

1. Gas requirements of the by-product oven.
2. Gas requirements of the iron and steel industry.
3. Geographical considerations.
4. By-product coke plants for gas manufacture independent of iron and steel plants.
5. Manufacture of mixed gases.

GAS REQUIREMENTS OF THE BY-PRODUCT OVEN

At present, it is the usual practice to employ part of the gas produced in the coking operation for heating the ovens. With the development of the modern regenerative oven, a high degree of heating efficiency has been obtained and the records of a number of Koppers plants show less than 40% of the total gas used in coking the coal. This amounts to approximately 8% of the calorific value of the coal. The remainder of the gas, amounting to from 6000 cu. ft. to 7000 cu. ft. per net ton of coal charged, is surplus available for use outside of the plant and may be either straight gas or "rich gas." In the first case, the surplus gas is simply an average of the total gas produced and has the same composition as the portion used for heating the ovens. In the second case, the plant must have a system of gas separation wherein the "rich gas", produced in the earlier stages of the coking process and containing higher percentages of hydrocarbons which gives it a higher heating value, is withdrawn and treated in a separate system of apparatus, while the lean gas, produced in the later stages of coking, is treated separately and used for heating the ovens. With properly selected coals, the modern by-product coke plant will produce straight gas having a heating value of 560 B. T. U. per cubic foot after removal of benzols. It is usually assumed that gas separation will be necessary if local requirements call for a heating value of more than 560 B. T. U. per cubic foot, unless the benzols are allowed to remain in the gas. The estimates in any case depend upon the kind of coal available. With gas separation, it is easy to produce surplus gas of over 600 B. T. U. per cubic foot, and the heating value may be still further increased by the use of benzol obtained from the lean gas to enrich the rich gas; but we believe that little consideration should be given to any proposition of supplying gas containing benzols. Considering the matter in its broadest aspect, apart from any arbitrary local standards, gas separation will, in most cases, be found not to be worth the additional investment and expense required. From an economic standpoint, the interests of the gas producing company and consumer are identical and both are beginning to recognize that the old standards of high candle power and high heating value are expensive

and unnecessary. The present tendency, in building by-product coke plants for gas manufacturing purposes, is to eliminate gas separation and provide straight gas from which the benzols have been removed.

Modern by-product coke oven engineering has not been content with the saving of 60% of the total gas produced as surplus, but has found means to render the entire production of gas available for use outside the plant. This has been accomplished by the utilization of producer gas for heating the ovens. As will be noted later, blast furnace gas or other low grade gases may be substituted for producer gas. In the use of such gases, preheating is essential, and the most economical means in combination with the by-product coke oven has been achieved in the Koppers combination oven, which will be described in a later section of this paper. This oven may be heated either with producer gas or with coke oven gas and affords the maximum flexibility with respect to gas production. The combination oven is of special importance from the standpoint of the natural gas interests. It is indispensable for any plant built primarily for the manufacture of gas and may soon even be considered indispensable to by-product coke plants affiliated with the iron and steel industry, as will be shown in the next section.

GAS REQUIREMENTS OF THE IRON AND STEEL INDUSTRY

In any consideration of the by-product coke industry, we cannot neglect its intimate relation with the iron and steel industry, and this relation profoundly affects any estimates that may be made in connection with the utilization of coke oven gas. More than 90% of the coke manufactured in the United States is used in iron and steel manufacture. Although it is true that many plants have been built altogether apart from iron and steel plants for the primary purpose of gas production, nevertheless, under present conditions, most of these plants depend very largely upon blast furnaces and foundries for the bulk of their coke sales. The majority of the by-product coke plants are built in conjunction with the iron and steel works that they serve, and it is universally agreed that this close relation is to the best interests

of the iron and steel industry. The availability of coke oven gas for various uses around the iron and steel works is one of the principal reasons why this is true.

During recent years, much thought has been given to the economic balancing of the fuels produced in iron and steel manufacture. It is generally agreed that a complete steel plant comprising blast furnaces, open hearth furnaces, rolling mills and by-product coke ovens will need all of its blast furnace gas and all of its surplus coke oven gas for its own use. In addition, the coke oven tar has been found to be excellently adapted for heating open hearth furnaces. In the case of merchant blast furnace plants manufacturing their own by-product coke, very little of the surplus coke oven gas is needed on the plant, and practically all may be sold.

What then are the prospects of obtaining coke oven gas from iron and steel plants operating their own by-product coke ovens?

1. As has been stated, practically all of the surplus coke oven gas from merchant furnace plants is available. To this may be added such additional coke oven gas as may be obtained by using producer or blast furnace gas for heating the ovens.
2. Considerable quantities of coke oven gas are wasted at steel plants during week-end shut downs. The amount of this depends upon local conditions and is very difficult to estimate; but in many cases this possible source of supply is worth investigating.
3. Steel plants using all their surplus coke oven gas may, under certain conditions, find inducement to use producer gas for heating the coke ovens, thus releasing considerable quantities of high grade gas for sale.

Since it may be fairly assumed that all the surplus gas produced by coke ovens operating in conjunction with merchant furnaces is already being utilized, the question of obtaining further supplies of gas from existing installations is, therefore, narrowed down to the probable relief that might be

afforded by the substitution of producer gas for oven heating. We are at once confronted with the fact that no plant of by-product coke ovens operating as a part of an iron and steel plant, is now adapted to the economical utilization of producer gas. The combination oven is the only type that can use producer gas with the requisite degree of efficiency, and although the difference in structure between this and the ordinary Koppers coke oven is comparatively simple, no battery of coke ovens could be adapted for use as combination ovens without rebuilding. It is, therefore, to the interests of natural gas men, in looking to iron and steel industries for additional supplies of high-grade gas, to become acquainted with the merits of the combination oven and to impress the various iron and steel companies with the desirability of replacing their present ovens with combination ovens, whenever rebuilding is necessary, and of arranging their plans so that future extensions of existing plants will comprise combination ovens instead of ordinary coke ovens.

The use of combination ovens in plants built primarily for gas production is several years old, and these plants have already given convincing demonstrations of success; but the idea of building combination ovens for iron and steel plants is comparatively so recent, and the various arguments in relation to it are so important, that it is desirable to discuss the matter somewhat at length. In the first place, the use of producer gas for heating by-product coke ovens has a number of valuable operating advantages over the use of coke oven gas. These will be described in a later section, devoted to a technical description of combination ovens, and may be summed up in greater convenience of regulation and economy in labor. These operating advantages are important, but might not alone be sufficient incentive for the substitution of combination ovens. There are, however, a number of economic considerations that seem to prove that the adoption of the combination oven is desirable, either on account of present inducements, or for the sake of providing insurance against future developments.

VARIOUS PRODUCER GAS OPERATIONS FOR COKE OVEN HEATING

In considering the economic operation of gas producers in connection with by-product coke ovens, several possibilities present themselves, which, when considered in the light of the potential economic advantages, is one of many arguments in favor of building every by-product coke plant so that producer gas may be used at any time for heating the ovens if desired.

This subject has been discussed at some length in a paper by Joseph Becker and F. W. Sperr, Jr., recently presented before the Blast Furnace and Coke Association of Chicago, and the principal arguments are taken from this paper.

First, the producers may be fed with small sized coke unsuitable for use in the blast furnaces. Here the equipment is simple and comparatively inexpensive, especially with respect to the gas cleaning apparatus. The amount of coke required for the producers is 12 to 14% of the weight of the coal charged into the ovens. This amount may readily be obtained by properly screening the oven product, leaving a high grade, thoroughly clean coke for the use of the blast furnaces.

Second, where there is available a cheap coal, having fair coking qualities, but unsuitable for the manufacture of blast furnace coke, such coal may be coked in some of the by-product ovens, delivering, thereby, its by-products and furnishing sufficient coke for the operation of the gas producers.

Third, where there is available cheap low grade coal unsuitable for making blast furnace coke, such material may be used directly in the gas producers.

Fourth, by-product producers may be installed using any coal available. The equipment and operation of by-product producers fits in very well with that of the by-product coke plant, and the combination, costing much less than separate plants, offers many possibilities for increased economy and valuable returns. Heretofore, on account of coal values, the employment of by-product gas producers has been more extensive in Europe than in America, and here, with the present appreciation of coal values, their development presents enormous possibilities.

THE KERPELY GAS PRODUCER

The type of producer conspicuous in European use in connection with by-product coke ovens and elsewhere is the Kerpely producer. The Koppers Company controls the American patent rights on this type of producer and is actively adapting it to American conditions for its by-product coke oven operations and in connection with by-product producer plants. The next few years will witness much important progress along this line.

ECONOMIC CHANGES FAVORING COKE OVEN GAS

The situation is that, on the one hand, the development of the gas producer, whether using coal or coke in connection with by-product coke ovens, together with the successful and advantageous application of producer gas to oven heating, are such as to offer the strongest inducements for this method of heating; while on the other hand, the demand for high grade gas is increasing so that every by-product coke plant in the country is, sooner or later, going to be required to render available every cubic foot of coal gas that it makes.

It is eventually going to be considered rank inefficiency for any plant to use this valuable gas for the purpose of heating its ovens, which purpose could even be better served by lower grade gas. These requirements are going to be brought about by the increasing shortage and cost of good coal, the increasing shortage of natural gas and fuel oil, and by the advantages of coke oven gas over lower grade gases from the various standpoints discussed. In the face of this, it is plain that every new battery of by-product coke ovens built in connection with a steel plant or blast furnace ought to have provisions so that, at any time, producer gas equipment can be added to the plant and so that the ovens can be heated either with this gas or with blast furnace gas.

THE COMBINATION OVEN AND ITS RELATION TO FUTURE DEVELOPMENTS

Suppose that, in the case of a given projected plant, it might possibly appear, on the face of present financial returns, that there would be no marked present gain from the installation of

gas producers in connection with the coke ovens. Nevertheless, assuming that the life of a battery of modern coke ovens is from 10 to 15 years, and in view of the great economic and engineering progress possible in the life of such a plant, one should hesitate to commit himself to building plain coke ovens, which would practically require rebuilding before they could use producer gas economically. The use of producer gas or blast furnace gas might well be advantageous a few years hence, if not now. The building of combination ovens is, in effect, providing insurance against future contingencies at relatively low cost and with promise of large returns.

As a further consideration, it should be pointed out that the combination oven can be heated with blast furnace gas as well as with producer gas, and under certain conditions, this method of heating has the advantage of requiring very small expense for equipment to release large quantities of high grade coke oven gas.

GEOGRAPHICAL CONSIDERATIONS

It is a striking fact that the great majority of by-product coke plants have a most fortunate location, with respect to the advantageous disposal of the gas that they produce. The locations, too, are remarkably fortunate when considered in connection with natural gas interests. Table 2 has been prepared to show the number of by-product coking plants that are grouped in, or within convenient reach of seven great industrial districts, viz.,

1. The Chicago and Milwaukee district, including Joliet and the great plants at the southern end of Lake Michigan.
2. The Detroit and Toledo district.
3. The Cleveland and Pittsburg district, including the plants at Youngstown, Steubenville, Johnstown, and as far south as Fairmont, W. Va.
4. The Buffalo district.
5. The eastern Pennsylvania district, including the plants near Harrisburg, South Bethlehem, and Philadelphia.

6. The Birmingham district, extending north to Gadsten and south to Tuscaloosa.
7. The Ohio River district, lying between Cincinnati and Wheeling.

The table shows the number of ovens in each district and the estimated maximum capacity for coking coal and manufacturing gas. This maximum rated capacity will, of course, never be reached, and a factor of 80% may be used to represent normal operating conditions. The list includes plants in construction May 1, 1920, as well as the plants that are in regular operation.

At present, there are very nearly 11,000 by-product coke ovens in active operation, or approaching completion, in the United States. These ovens have an estimated maximum capacity of about 66,000,000 tons coal per year. The table shows that 87% of the present by-product coking capacity in this country is comprised within the seven districts named. 35% of this capacity is located in the Cleveland-Pittsburgh district, which is also the largest natural gas consuming district. The total amount of by-product coke oven gas manufactured in this district is considerably more than the annual production of natural gas in the state of Pennsylvania. Of the seven districts, five, (omitting the eastern Pennsylvania and Birmingham districts) are, or have been, in the past, important consumers of natural gas.

It is of interest to estimate how much of the by-product coke oven gas produced in these important districts is used for heating the ovens. All of the ovens listed are now being heated with coke oven gas. Taking 80% as a factor for normal working conditions we have an estimated production of 408,000,000,000 cubic feet gas. On account of the fact that many of the oven installations are of old design and relatively inefficient in heating, at least half of this gas is being used for coking purposes, so that over 200,000,000,000 cubic feet gas per year could be released. if the plants had combination ovens operated with producer gas. This is about equivalent to the combined natural gas production of Pennsylvania and Ohio. It is 38% of the entire amount of natural gas consumed east of the Mississippi river.

It is important to note further that the future growth of the by-product coke industry will naturally be in the great gas consuming districts. Much of it will still be in the seven districts mentioned. It has been estimated that the blast furnaces in Ohio and Pennsylvania, at present, have a normal consumption of nearly 45,000 tons beehive coke per day. If this coke were made in by-product ovens it would entail the use of 22,000,000 tons coal per year, and there would be recovered a total of 231,000,000,000 cu. ft. gas per year. 60% of this, or 138,600,000,000 cubic feet would at once be available and, although a great deal of this would be consumed in the various steel plants, it would nevertheless contribute its equivalent toward the conservation of natural gas and oil, because in many cases, it would be used to supplement or replace these fuels, thus releasing equivalent quantities for use elsewhere. If combination ovens are built, the entire amount can be rendered available when the demands of gas consumers so require. Here again, a study of the whole situation will show that the building of combination ovens is of very great importance, and the interests most concerned, of which the natural gas industry is one, should use every influence to bring this about.

BY-PRODUCT COKE PLANTS FOR GAS MANUFACTURE INDEPENDENT OF IRON AND STEEL INDUSTRY

The growth of the by-product coke industry independent of the iron and steel industry and the prospects for developing it primarily as a source of gas without the necessity of relying on the needs of blast furnaces, depend almost entirely on the question of coke disposal. The extension of the domestic coke market is of great importance in this connection, and much progress has recently been made in this direction. The situation bears close relation to the condition of anthracite coal supply, which is yearly becoming poorer in quality and more inadequate in amount. Just as the availability of natural gas has accustomed millions of American people to the use of gas fuel for domestic purposes, so the wholesale use of anthracite coal as domestic fuel has paved the way to the introduction and substitution of coke.

The best type of plant for the manufacture of gas and domestic coke is one of combination ovens with gas producers. Such a plant possesses the flexibility requisite to meet the varying demands of gas consumers. The output of gas for sale may be increased or decreased four or five hundred percent according as the ovens are operated with producer gas at their maximum coking time, or as they are heated with coke oven gas at a very low rate of coking. The producers may be operated either with coal or with coke, as has been described in previous paragraph.

As the demands of the natural gas industry for a supplementary supply of high grade artificial gas outgrow the possibilities afforded by such by-product coke plants as are operated in connection with iron and steel plants in any locality, it is certain that additional by-product coke plants will be erected primarily to meet the needs of the natural gas industry. The choice of location of such plants will, in many cases, be quite different from that which has been found advantageous in the case of plants hitherto constructed. It has been pointed out that the proper location for by-product ovens operating in connection with iron and steel plants that need the coke oven gas, is in close proximity to the plants that they serve. The main considerations governing the location of coke ovens built to supply coke to merchant blast furnaces, or to supply gas to cities, are the price and disposition of the gas and the freight rates on the coal used and the coke produced. The choice in this case is usually a compromise between cost of freight and price obtainable for gas, together with accessibility to the points of consumption of the gas. Much might be saved if it were possible to build the by-product coke ovens at the coal mines, as has been the general practice in the case of beehive ovens; but this has hitherto seldom been permissible, either because the mines were located too far from the consumers of gas, or because the locations were in districts well supplied with natural gas. With diminishing natural gas supply, the peculiar relations of the natural gas industry with respect to the coal mining regions of Pennsylvania, Ohio and West Virginia are likely to make it profitable to build by-product coke ovens at the mines, because many coal mines supplying good coking coal are within easy reach of large natural

gas distributing systems into which the coke oven gas could readily be conveyed. With a reasonable price for the gas and with proper methods of coke disposal, such plants can operate with maximum economy. The low price of land at the mines is an important item in this connection.

MANUFACTURE OF MIXED GASES

It is the opinion of many economists who have studied the problems of conservation and efficient utilization of our fuel resources that the ultimate ideal should be the conversion of all the coke into gas at the by-product coke plant, so that the plant will supply all of its fuel product in gaseous form. It may be that we are in a transition period that will ultimately end in discontinuing entirely the use of solid fuel for most industrial and for all domestic purposes. This would mean that there would ultimately be no domestic coke problem, but it must be recognized that any such transition period is bound to be a long one, and that while we are passing through it, the use of domestic coke must be extended and encouraged.

Progress toward the general use of gas as sole domestic fuel must necessarily be slow and depends largely on accustoming people to lower heat value standards. There can be no question that at present, from an economic standpoint, we are working on too high a level as regards the heating value of gas. Until people and public authorities generally are convinced that it will pay them better to allow their gas companies to serve them with gas of lower heating value, with a fairly adjusted compensation for the same, plants will have to be built to furnish gas of the high quality demanded. Those plants which are operated independently of an assured industrial coke market, such as that afforded by the iron and steel industry, must meet and solve the question of coke disposal.

The failure of natural gas supply first manifests itself in a scarcity in winter-time peak loads for house heating. It is becoming increasingly manifest that domestic consumers will be forced to meet these periods of scarcity by the use of auxiliary heating equipment burning solid fuel. This solid fuel demand

will give the by-product coke plant an outlet for considerable domestic coke.

The proposition of gasifying all of the coke produced at the by-product coke plants leads to the subject of mixed gases, because all of the surplus gas produced from the coke over and above the requirements of the plant for its own steam, power, and heating, will, in the majority of cases, be mixed with the coke oven gas before distribution to the consumer. This subject is one of great importance. It has such a wide scope and involves so many subsidiary questions, both economic and technical, that it cannot be adequately treated within the limits of this paper. Attention will, however, be directed to a few leading points.

1. The mixed gas sold to the consumer must have such characteristics with respect to specific gravity and heating value as to meet his purposes satisfactorily without unduly increasing the investment required for his appliances.
2. The question of the rate of heating afforded by the gas is in many cases more important than the total heat units supplied. The rate of heating is, of course, a function of the flame temperature. For example, straight producer gas has been burned in cook stoves, but its flame temperature is so low that it works much too slowly to be practicable.
3. It is very questionable whether it ultimately pays to sell gas containing a large percentage of inert, incombustible constituents for wide distribution. The principle involved is much the same as in the transportation of coal containing high percentages of ash.
4. There are two generally feasible methods for the production of mixed gas at the by-product coke plant with complete gasification of the coke, viz.:

(A) Gasification of the coke in producers using part of the producer gas to heat the ovens and the remainder to mix with the coke oven gas. This

method would produce per ton of coal over and above plant requirements, 10,500 cu. ft. coke oven gas of 560 B. T. U. and 75,600 cu. ft. of producer gas of 130 B. T. U., making 86,100 cu. ft. mixed gas of 183 B. T. U.

(B) Part of the coke is gasified in producers making sufficient gas to heat the ovens. The remainder of the coke is put into water gas generators and its carbon converted into blue water gas which is mixed with coke oven gas. This method will produce per ton of coal 10,500 cu. ft. coke oven gas at 560 B. T. U. and 22,600 cu. ft. blue water gas of 300 B. T. U., making 33,100 cu. ft. mixed gas of 383 B. T. U.

The second method described produces a mixed gas of a heating value that is satisfactory for all domestic purposes. The mixed gas produced by the first method is capable of wide industrial application, but the possibilities of utilizing it for domestic purposes have not yet been developed.

THE KOPPERS BY-PRODUCT COKE OVEN

During the past period of over ten years since the first plant of Koppers ovens was put in operation in America nearly 90 per cent of the by-product coke oven capacity installed in this country has been of this type. A description of the oven and by-product recovery systems introduced by The Koppers Company may properly be given as typical of modern American practice. Such descriptions have been widely published and are readily accessible, so the purposes of this paper will best be served by limiting the discussion to the oven systems and to certain recent development of these that are not so generally known.

Each of the Koppers oven systems embodies a basic heating principle invented by Mr. H. Koppers, and this principle has been the prime factor in their remarkable success. It has been concisely described as the cross regenerative heating principle. Each set of heating flues in the wall of the oven has its own individual set of regenerators extending crosswise of the oven

battery. Each flue and each regenerator is capable of individual regulation and each set of heating flues with its corresponding regenerators is capable of regulation as an independent unit.

The Koppers Cross Regenerative By-Product Coke Oven (See Figs. 1, 2 and 3) which is the one at present used in connection with iron and steel plants is a narrow brick chamber, 37 to 40 feet long, 9 to 11 feet high, with an average width varying from 16 to 20 inches, according to the character of the coal

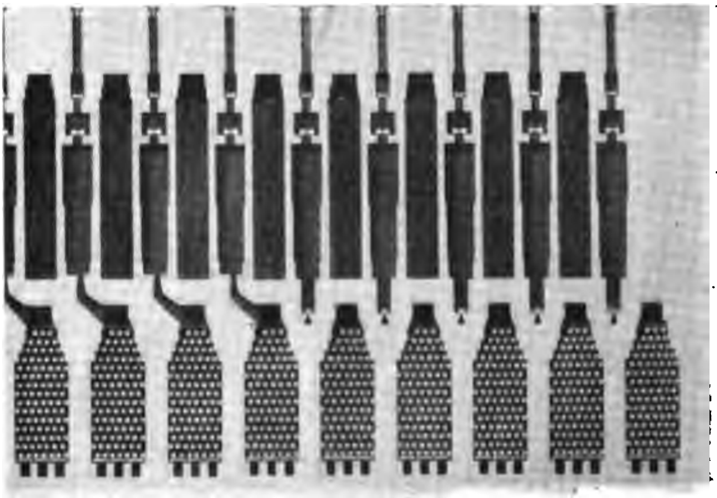


FIG. 1.

to be coked, and has a capacity of from 11.5 to 16 net tons of pulverized coal. The ovens are separated, one from another, by a series of vertical flues, in which the fuel gas is burned to provide the heat necessary for coking. Directly under each oven chamber is an individual regenerator, where the air for combustion in the flues is preheated, and beneath each row of flues is a solid brick wall separating the regenerators. This wall serves as a strong foundation on which the flue wall rests as columns

to support the roof of the ovens. As the flue walls themselves are very strongly built, this form of construction combines strength with saving of space, for intervening walls to support the oven roof are eliminated and the distance from center to center of the ovens is reduced to a minimum.

In the top of each oven chamber there are five openings. One at the end of the oven provides an outlet for the gas. The other four are for charging the coal.

The doors at each end of the oven are sealed with clay to prevent leakage of air into the chambers, provision being made for removing the doors when coking is completed and replacing them after the charge of coke is pushed.

HEATING OF OVENS

The oven heating gas under the pressure of the gas holder passes through the fuel gas main and into the risers opposite each oven. (Fig. 2). . From the risers the gas enters the gas duct lying under the flues. This duct is divided into two parts, each part serving the oven flues connected to the regenerator on that side of the oven battery. At the base of each flue is a removable nozzle, a special feature of the Koppers oven, through which the gas passes into the flue.

Air for combustion is heated to a high temperature by being drawn through the brick checker work of the regenerator. The highly heated air enters the base of the vertical flue through an air port and meets the incoming gas stream, which it ignites, the burning gases passing upward in the flue.

Combustion takes place in the flues along half the oven length at one time. The hot gases of combustion passing out of the vertical flues travel along the oven in the horizontal flue at the top of the vertical flues. They pass downward in the vertical flues on the other half and into the opposite regenerator. Here, in traveling through the brick checkerwork, they give up a large part of their heat, which is taken up later by incoming air. The gases of combustion then pass out into the waste gas flues and to the stack. The direction of flow of gases through the oven-heating flues is automatically reversed at regular intervals. In this way, the regenerators recover and return to the

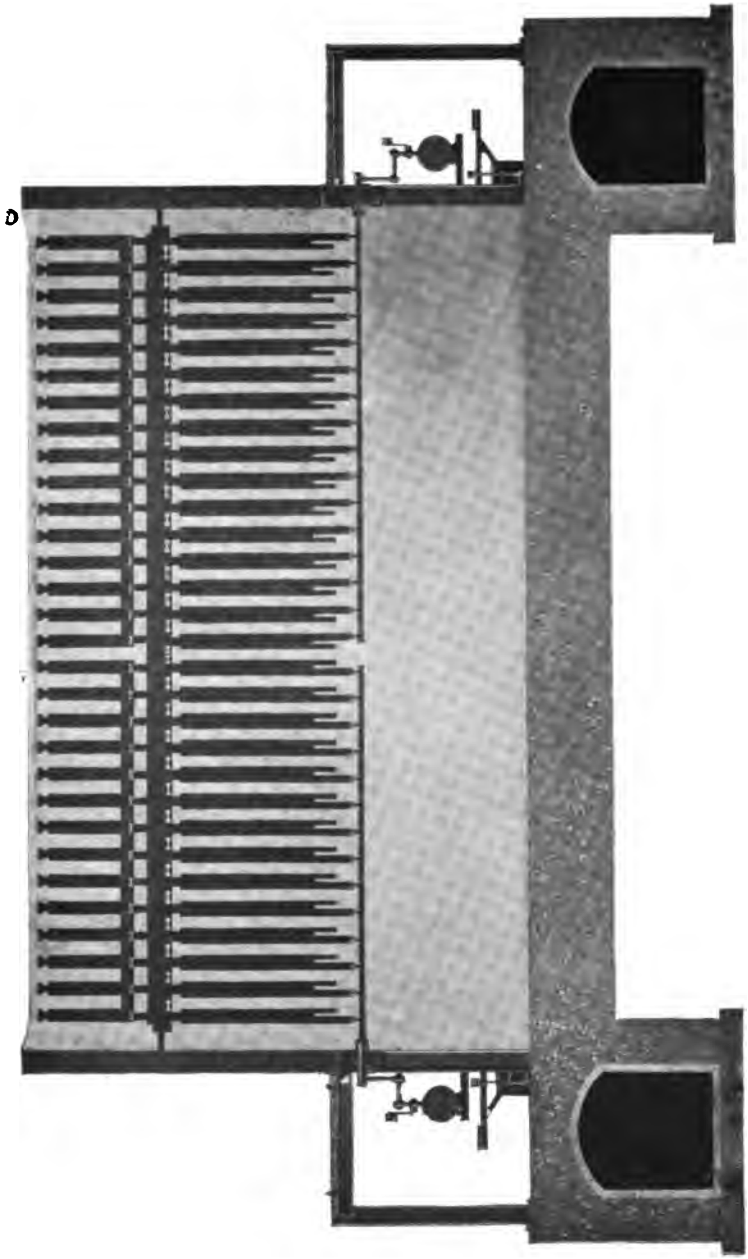


Fig. 2.

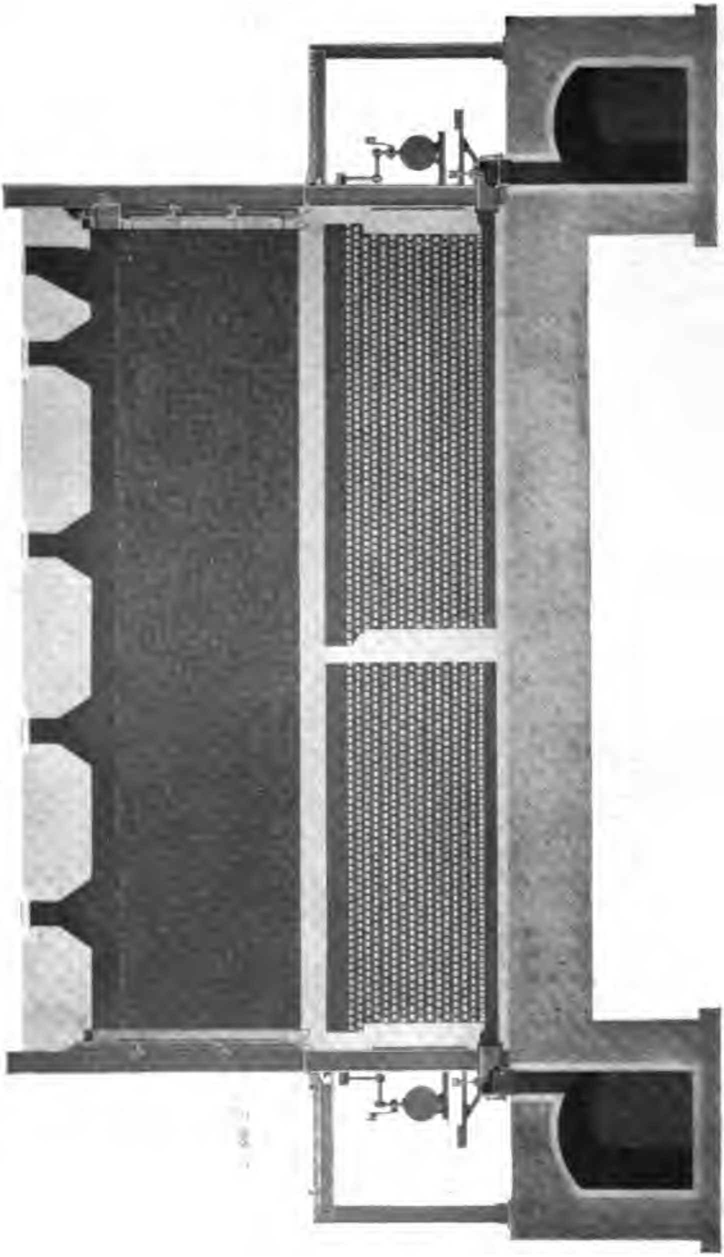


Fig. 3.

oven flues a large amount of heat, which, without their use, would pass out through the stack into the atmosphere or which might be partly utilized in waste heat boilers.

REGULATION OF COMBUSTION

Stack draft is used for drawing in the air through the regenerators and for removing the gases of combustion. All the fuel gas valves are capable of adjustment as to the size of opening, and the gas is supplied under the constant pressure of a small gas holder. By changing the size of the nozzle at the base of the vertical flue it also is possible to increase or diminish the amount of gas supplied. Each vertical flue is accessible for inspection and regulation through an opening in the brickwork above it, which forms a small upper flue leading to the top of the battery, closed by an easily removable cast-iron cover. The opening from this upper flue into the top of the horizontal flue is covered by a sliding brick which prevents radiation.

At the opening from the vertical heating flue into the bottom of the horizontal flue there is another sliding brick which is used to regulate the flow of products of combustion into the horizontal flue, thus controlling the air supply. Inspection openings also are provided at the ends of each horizontal flue.

This arrangement of openings permits the inspection of the entire interior of the vertical and horizontal flues, and of the condition of the oven walls during heating. It also allows regulation of the temperature of each flue independently, so that more heat or less heat, may be transmitted to the oven throughout the entire length of the oven wall. This is especially advantageous in the tapering oven, now generally used in order to facilitate pushing of the coke, since the wider end of the oven requires more heat than the narrower end. In addition, dampers are provided to regulate the draft in each individual regenerator outlet and in the flues leading to the stack.

THE KOPPERS COMBINATION OVEN

This oven is designed to be heated either with coke oven gas or with low grade gas, such as producer or blast furnace gas.

The construction and operation will be understood by inspection of Fig. 4. It will be noticed that there is a division wall built lengthwise through each regenerator and two lines of ports instead of one from the regenerator into the flues. When coke oven gas is used for heating, all of the regenerators are used for air only, and the operations of heating are conducted exactly as described in the case of the coke oven. When producer gas is used, the coke oven gas distributing flue is idle. One genera-

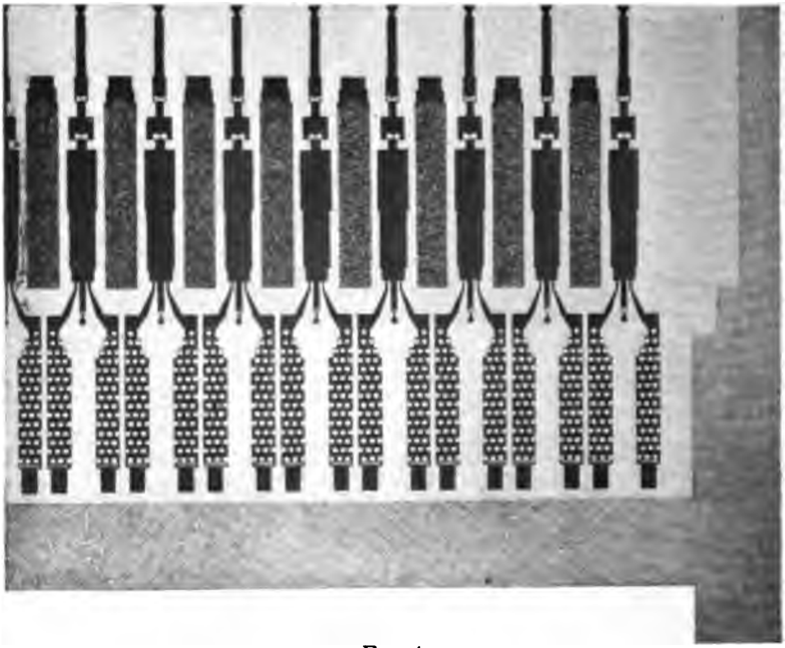


Fig. 4.

tor is entirely given over to preheating of air, the air from one side of the central division wall going to one set of flues and that from the other side to the next set of flues. The adjacent regenerator is used to preheat the producer gas and distributes it in a similar manner, the gas in one side of the regenerator going to one side of the oven and that from the other half going to the other side of the oven. By thus having the same gas in both

chambers of the divided regenerator, any leaks through the narrow division wall can cause no trouble. Air and gas are separated by the heavy gas-tight pillar walls under the flues and premature combustion of the fuel gas is thereby prevented.

A typical plant of combination oven that has for some time been operated with producer gas is that of the Providence Gas Company, Providence, R. I. This plant has 40 ovens which taper from 18½ in. in width at the discharge end to 15¾ in. at the pusher end, are 9 ft. 10 in. high and 37 ft. long (inside dimensions) and have a rated capacity of 11.4 tons coal per charge. Experience with the use of producer gas at this plant has demonstrated a number of advantages over the use of coke oven gas that should be briefly described here. It should be borne in mind that with coke oven gas we are dealing with a fuel containing high percentages of hydrogen and hydrocarbons and capable of intense local overheating unless the conditions of combustion are carefully regulated. Furthermore, unless proper precautions are taken, there is a tendency for some of the hydrocarbons to be decomposed or "cracked" by the heat, which causes accumulation of carbon and occasional stoppages in the gas distributing systems.

With producer gas firing, on account of the absence of hydrocarbons, there is no accumulation of carbon in the gas distributing system. Practically no attention need be given to gas pipes and flues which means economy in labor. The flue temperatures are easily adjusted and remarkably uniform. There is less possibility of localized overheating. With producer gas, we are dealing with a fuel that is handled in relatively larger volumes than is the case with coke oven gas and no such fine adjustments are necessary with the former as with the latter. Furthermore, any slight irregularities in the rate of gas flow, in the way of adjustment, or in the height of flame, make much less difference in the coke temperature than would result from similar irregularities in the case of coke oven gas. With producer gas it is a much simpler matter to maintain efficient and uniform heating with a low percentage of excess air than when using coke oven gas. At Providence, the analysis of the products of combustion showed 17 to 18% carbon dioxide with about 1% of oxygen

and practically no carbon monoxide. Such a close approximation to theoretically perfect conditions of combustion combined with uniform heating is a remarkable achievement in the use of producer gas. At 14 hours coking time the temperature of the stack gases was about 350°C.

RAPID COKING WITH PRODUCER GAS

All of these operating results and advantages have been demonstrated at the Providence Plant. The use of producer gas has been found to be excellently adapted to the maintenance of very short coking times, where absolute uniformity of temperature is of the utmost importance. The ovens were operated

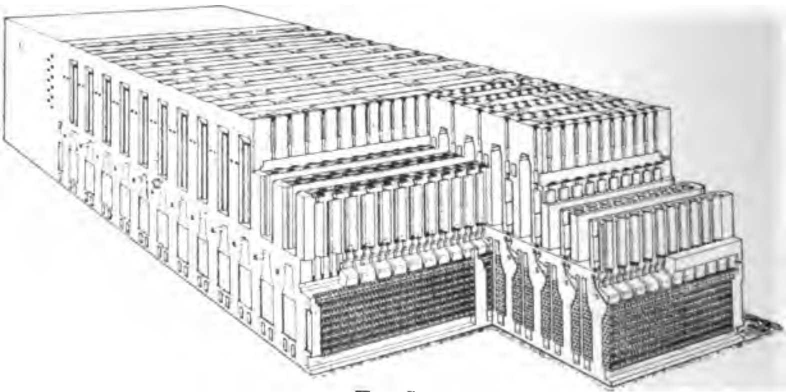


FIG. 5.

with straight producer gas at 14 hours coking time for a test period of two weeks and were operated at 14½ hours coking time for a period of four weeks. It was demonstrated that such rates of coking would be maintained regularly and without extra attention. The 14 hours coking time corresponds to a rate of carbonization of one inch oven width at the wide end in 45.4 minutes.

THE TRIANGULAR FLUED OVEN SYSTEM

The ordinary Koppers oven as hitherto constructed has vertical heating flues of rectangular cross section. A fundamentally important improvement has recently been introduced by The

Koppers Company in the triangular flued oven which has vertical heating flues of triangular cross section. This has been constructed both as a coke oven and as a combination oven. Fig. 5 shows a perspective drawing of a battery of triangular flued

FIG. 6.

oven of the combination type. The actual construction of the flues will be better understood by reference to Fig. 6 which is a photograph of one of the oven walls of this system as it is actually being built. The triangular flued ovens have proven so suc-

cessful in actual operation and offer so many advantages that The Koppers Company is recommending their adoption for all future installations. The first installation of this system was a battery of five combination triangular flued ovens built as part of the plant of the Minnesota By-Product Coke Co., St. Paul, Minn. This battery began its test operation in June, 1918, and has been in continuous operation for nearly two years. The regular coking time during this period has varied between about 16 hours and 14 hours, according to coke and gas demand, but during a test period, the ovens have been operated for some time at a coking time of 13½ hours in order to determine their maximum coking speed. These ovens have demonstrated decided advantages from the standpoint of durability, low cost of operation, regularity of coking, heating efficiency, and flexibility of adjustment. The system affords the maximum strength of wall for the investment required to produce the maximum heating efficiency. Each wall has a double flue system, the flues overlapping in such a way that, while they are independent in operation, they are supplementary in effect. This double flue system is such as to afford a maximum amount of direct heat transfer in the coking operation. The cost of the new system is no greater than that of the system hitherto constructed. Besides the original battery of triangular flued ovens at St. Paul, a battery of 60 of these ovens has been installed for the Jones and Laughlin Steel Co. at Pittsburgh. This battery began operation early in March, 1920, and has been giving excellent performance. Work has also been started on the construction of 100 triangular flued combination ovens for the Chicago By-Product Coke Co., which will furnish gas to the Chicago Gas Co., and on 60 triangular flued ovens for the Dominion Iron and Steel Co., Sydney, Nova Scotia.

THE NEW KOPPERS GAS OVEN

Of great interest to the gas industries is the new Koppers gas oven, a recent development that combines the advantages of all the engineering improvements that have lately been achieved in by-product coke oven construction. In addition to heating by coke oven gas or producer gas, this gas oven is adapted to the

use of a third method of heating by what is known as the waste gas return system. The purpose of this system is to obtain with coke oven gas the same flame characteristics that are obtained in the heating flues with the use of producer gas and the results achieved are of great importance, especially in very high oven systems. The new Koppers gas oven is a triangular flued, combination, cross regenerative oven utilizing the Koppers heating principle and is adapted to the use of the waste gas return system by a very ingenious modification, which requires no internal

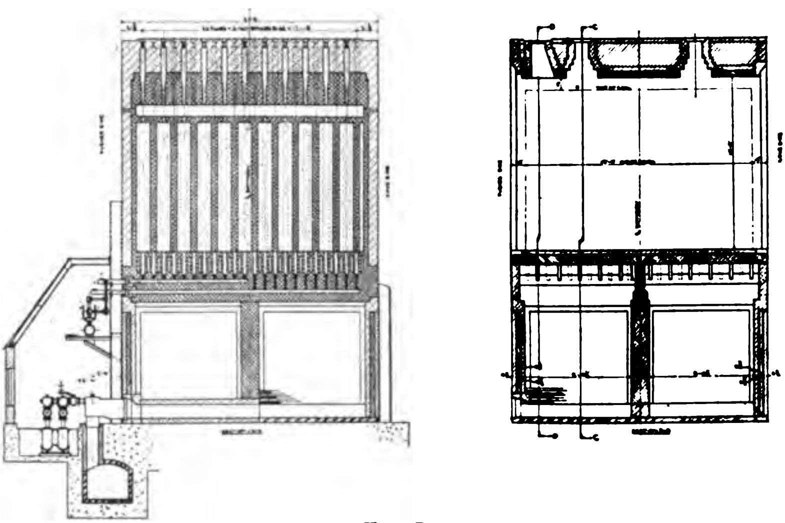


Fig. 7.

re-arrangement of the oven structure and only a little additional apparatus for the cooling and distribution of the returned waste gas. Sectional drawings of the gas oven are shown in Fig. 7, and a perspective drawing of a typical small plant is shown in Fig. 8. It will be observed that all the gas mains and distributing pipes are located on one side of the battery, and that there is a single stack flue located on the same side. This feature effects a considerable saving of investment and reduces the cost of operation. The upper main shown in circular section just outside the oven structure is for the coal gas supply. There are

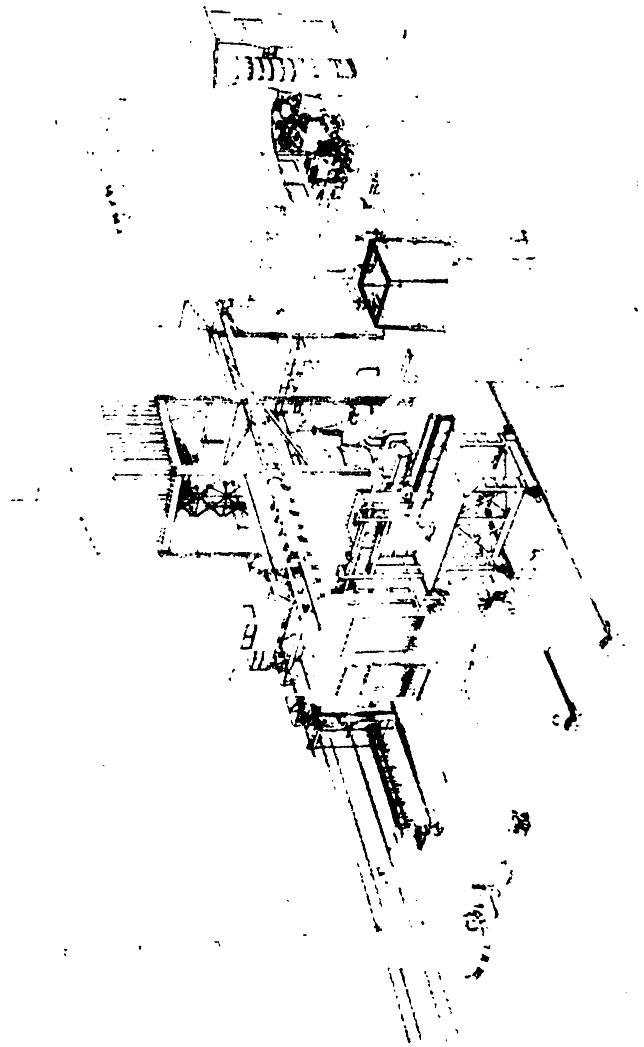


Fig. 8.

two coal gas distributing flues, the upper communicating with the nozzles on the half nearest to the gas mains, while the lower flue communicates with the nozzles on the far half of the wall. There are two lower gas supply mains shown in U-section. One of these is for producer gas and the other for returned waste gas. The waste gas outlets at the bottoms of the regenerators are positioned so that the passages from the regenerators on the far side of the battery pass along the bottom of the regenerators on the near side and communicate with the stack flue. Alternate regulators serve for air and for producer gas, or as the case may be, for air and for returned waste gas. Thus all of the fuel gas and returned waste gas inlets, as well as all of the waste gas outlets, are brought together on the same side of the battery —an accomplishment which greatly favors convenience of operation.

When the oven is heated with straight coke oven gas and air, each of the regenerators is used for preheating the air for combustion. In the first half of each heating cycle, the coke oven gas passes through the nozzles into the vertical heating flues. There it meets the preheated air from the left hand regenerator and burns upward in the vertical flues on the same side. The products of combustion pass to the right through the upper horizontal flue and down through the vertical flues and into the regenerator on the right hand side; thence they pass to the left through the flue running along the bottom of the left hand regenerator and into the stack flue. After a given interval, usually half an hour, the process is automatically reversed. The coke oven gas is shut off of the left hand distributing flue and turned into the long lower distributing flue communicating with the vertical flues on the right hand side. The air passes into the right hand regenerator through the flue that lies along the bottom of the regenerator on the left and the preheated air meets the coke oven gas in the right hand vertical flues. The products of combustion pass along the horizontal flue to the left, thence down through the vertical flues into the left hand regenerator and out into the stack flue.

When producer gas and air are used for heating the oven, the coke oven gas distributing system is idle. One of the two

U-shaped mains on the lower left hand side just outside the main structure is used to convey the producer gas. Each alternate set of regenerators throughout the battery is used to preheat the air, while every other alternate regenerator is used for preheating the producer gas. In the first half of each heating cycle, the producer gas passes into alternate regenerators on the left hand side and upward through ports into the vertical heating flues, where it meets the preheated air from the adjacent regenerators and burns upward in the left hand vertical flues. The products of combustion pass along the horizontal flues to the right and down through the vertical flues into the right hand regenerators from which they go through the flues lying along the bottoms of the left hand regenerators into the stack flue. In the second half of the cycle after reversal, the producer gas passes through the flues along the bottoms of the alternate left hand regenerators into the corresponding right hand regenerators. The air is simultaneously handled in the other alternate regenerators. The remaining operations are obvious.

When coke oven gas is used with the waste gas return system, the producer gas mains are idle. The second U-shaped main on the left hand side of the battery is used for conveying the cooled waste gas back from the stack flue. This waste gas passes into alternate regenerators while the other alternate regenerators are employed for air in producer gas operation. These returned waste gas regenerators feed the reheated waste gas directly into the same vertical flues that are being directly fed with air from the adjacent air regenerators and with coke oven gas from the coke oven gas distributing flue. Thus, in the first half of each heating cycle, coke oven gas passes into the upper left hand distributing flue and through the nozzles into the vertical flues. There it meets simultaneously the preheated air coming from alternate regenerators on the left hand side and the preheated waste gas from the other adjacent alternate regenerators on the same side. The rest of the process and the operations in the second half of the heating cycle are obvious.

In one typical design this oven has a capacity of 7.6 net tons of coal and is of such width as to operate on 12 hours

coking time with a daily capacity of 15.2 net tons coal producing 160,000 cubic feet gas.

The possibilities of operating such ovens at 12 hours coking time has interesting application in reducing operating costs. A plant having ample gas storage capacity can be operated with two eight-hour shifts, only the heaters and producer operators being required on the third shift.

TABLE 1

Coal Used for Coke Manufacture in the United States

Year	*Coal Used for Beehive Coke*	*Coal Used for By-Product Coke*	*Total*
1910...............	53,559,285	9,529,042	63,088,327
1911...............	42,831,664	10,446,584	53,278,248
1912...............	50,810,319	14,767,543	65,577,862
1913...............	52,143,821	17,095,369	69,239,190
1914...............	36,123,729	15,500,021	51,623,750
1915...............	42,278,516	19,554,382	61,832,898
1916...............	55,084,958	26,524,502	81,609,460
1917...............	52,246,612	31,505,759	83,752,371
1918...............	48,166,719	36,867,721	85,034,440
1919...............	31,051,716*	35,695,500*	66,747,216*

*Estimated.

TABLE 2

Distribution of By-Product Coke Plants in the More Important Districts Showing the Maximum Rated Coal Capacity and the Maximum Total Coke Oven Gas Production Possible in Each District.

District	*Plants*	*Ovens*	*Tons Coal Per Day*	*Tons Coal Per Year*	*Total Gas Cu. Ft. Per Day*	*Total Gas Cu Ft. Per Year*
Chicago-Milwaukee	11	1,996	32,336	11,802,640	339,528,000	123,927,720,000
Detroit-Toledo	4	459	6,215	2,268,475	65,257,000	23,818,987,000
Cleveland-Pittsburgh	15	3,347	53,656	19,584,440	563,388,000	205,636,620,000
Buffalo	3	679	5,951	2,172,115	62,485,000	22,807,207,000
Philadelphia-Harrisburg (Eastern Pennsylvania)	7	934	11,547	4,214,655	121,243,000	44,253,877,000
Birmingham	7	1,171	18,013	6,574,745	189,136,000	69,034,822,000
Cincinnati-Wheeling (Ohio River)	4	396	5,500	2,007,500	57,750,000	21,078,750,000
TOTAL	51	8,982	133,218	48,624,570	1,398,789,000	510,557,985,000

TABLE 3

Typical Analysis of Gas from Koppers
By-Product Coke Ovens.

	CO_2	Illuminants	O_2	CO	H_2	CH_4	N_2	B.T.U.	Specific Gravity
STRAIGHT GAS Before removing Benzols	2.2	3.5	0.3	6.8	47.3	33.9	6.0	591	0.44
STRAIGHT GAS After removing Benzols	2.2	2.6	0.3	6.9	47.8	34.2	6.0	562	0.42
RICH GAS Before removing Benzols	2.6	4.3	0.2	6.3	46.3	35.0	5.3	630	0.45
RICH GAS After removing Benzols	2.6	3.2	0.2	6.4	46.8	35.4	5.4	605	0.42
LEAN GAS Before removing Benzols	2.1	2.0	0.3	6.0	58.0	27.0	5.6	531	0.38
LEAN GAS After removing Benzols	2.1	1.0	0.3	6.1	58.5	27.3	5.7	500	0.35

TABLE 4

Yields of Coke and By-Products in Koppers Ovens

FROM A TYPICAL COAL MIXTURE OF:

85% Pittsburgh High Volatile Coal
15% Pocahontas Low Volatile Coal

Metallurgical Coke	69% of coal	
Domestic Coke	2% of coal	
Breeze	4% of coal	
Surplus Gas	6,600 cu. ft.	per net ton
Gas for Heating Ovens	4,400 cu. ft.	per net ton
Tar	9 gallons	per net ton
Ammonium Sulphate	25 pounds	per net ton
Pure Benzol	2.08 gallons	per net ton
Pure Toluol	0.56 gallons	per net ton
Pure Xylol	0.32 gallons	per net ton
Crude Solvent	0.40 gallons	per net ton

Part or all of the metallurgical coke may be screened and crushed to furnish additional domestic coke. If producer gas is used for heating the ovens, there will be a surplus of 11,000 cu. ft. coke oven gas per net ton of coal.

ILLUSTRATIONS

At the conclusion of the presentation of the above paper Mr. Ramsburg then had thrown upon the screen moving pictures illustrative of his paper and explained in detail each slide as thrown upon the screen.

During this presentation President Oliphant said: Gentlemen, through the courtesy of Mr. Ramsburg he has consented to allow us to interrupt his remarks at this point as the time for recess and luncheon has now arrived. We will adjourn until 1:30 P. M. at which time he has some more most interesting moving pictures which he will proceed to exhibit. Now, let us try and get back promptly at 1:30 so as to have a good start. There is one thing further, gentlemen. A group picture of those in attendance at this meeting is to be taken immediately upon leaving the Convention Hall and the place where the picture is to be taken is back of the auditorium. Lunch will be served immediately following that in the same place as yesterday. We will now recess until 1:30 P.M.

SECOND DAY — AFTERNOON SESSION

WEDNESDAY, MAY 19, 1920

PRESIDENT OLIPHANT: Gentlemen, we will reconvene and Mr. Ramsburg will proceed with the moving pictures of By-Product Coke Ovens.

After Mr. Ramsburg had finished exhibiting the slides upon the screen, illustrative of the paper submitted, President Oliphant said:

Gentlemen, you have witnessed a very interesting and instructive demonstration. Mr. Ramsburg informs me that he will be very glad to answer any questions that may be propounded or enter into any discussion that you may wish. I would like to ask one question of Mr. Ramsburg. These present ovens, I believe, hold about twelve tons of coal?

MR. RAMSBURG: The ovens in this plant carbonize twelve and one-half tons of coal per charge.

PRESIDENT OLIPHANT: And that is to be increased in your new oven to what?

MR. RAMSBURG: I do not believe in building an oven that carries very much more coal than that. We are building them narrower and higher so that they will carry about thirteen tons of coal but I think that is about the limit as to the amount of coal that ought to be carbonized at one time. The narrower the oven the faster you can go, and the average is about one inch per hour. That is a sixteen-inch oven takes about sixteen hours but with the narrower oven you can go a little faster. On the contrary there is a limit to that because you can get to the point where it does not pay to have a narrower oven. That is one reason we are going into the higher oven so as to get the benefit of the narrow oven and still push the same amount of coke per push.

PRESIDENT OLIPHANT: I thank you. Is there anybody else who desires to ask any questions or to hear any further discussion?

DR. I. C. WHITE: I would like to ask if Mr. Ramsburg's company is doing anything to overcome the difficulties of mixing natural gas with by-product gas.

MR. RAMSBURG: I cannot say that we have run against that problem yet sufficiently to realize that there is any problem there. There is very little coke oven gas being mixed with natural gas at the present minute — apparently little and we have still got to face that problem if it is a problem. I presume with a gas of six hundred B. T. U.'s and about .4 gravity, mixed with a thousand B. T. U. gas with a .55 gravity there would be some problem to be solved with reference to that mixture, in overcoming any difficulties that might arise from the difference of thermal units and the difference in gravity but as yet we have not come against it; fortunately I suppose because we have had plenty of natural gas up to this time. I suppose it is going to be a problem in the future, owing to the decreasing supply of natural gas but however I think it can be solved quite easily.

PRESIDENT OLIPHANT: Any other discussion or any further questions, gentlemen?

MR. RAMSBURG: I would like to ask Dr. White if he had any occasion in mind, where they are having difficulties to overcome in the mixing up coke oven gas with natural gas.

Dr. White: That has been one of the problems which has come up more recently by reason of the shortage in the supply of natural gas and of course is a problem that is coming more and more into prominence each succeeding year. It was by reason of that fact that I asked Mr. Ramburg whether there had been any study of the problem of mixing, successfully, natural gas and manufactured gas, for it is very evident by reason of the waning supply of natural gas that the natural companies, if they hope to keep the business they now have, they must supplement the declining supply of natural gas either by by-product gas or by some other form of manufactured gas.

Mr. Ramsburg: Yes, I understand that.

Dr. White: That is what I had in mind when I asked the question.

Mr. Ramsburg: I thought your question indicated that there was a problem of mixing coke oven gas with natural gas which you have already encountered and had been trying to solve. Do you know where they are having any trouble doing it?

Dr. White: I have understood that there are troubles which have been encountered in an effort to mix the natural with the manufactured gas. I do not personally know any specific instance where they have attempted to mix it but I have understood that there are some troubles ahead in that regard and I was simply asking the question more from the technical side than from the practical side, realizing that it was a problem in the near future which would have to be solved if there should develop any problem in the matter to solve.

Mr. Ramsburg: We do not believe there is going to be any great trouble in that regard. For instance, in a great many plants where they mix water gas with by-product coke oven gas where the gravity of one is different from the gravity of the other and there is a marked variation in B. T. U.'s and where the coke oven gas is used in varying quantities they are not encountering any serious difficulties in the use of such mixture. Of course, that will depend upon the proportions in which you try to mix it and whether you do it regularly or not as to whether it will be any real problem.

Dr. White: Of course, a cold temperature will have a different effect upon natural gas as compared with by-product gas. The cold to which they would be subjected would condense one more than the other and I was wondering whether condensates might come out of manufactured gas which would interfere with transmission when mixed with by-product gas.

Mr. Ramsburg: Do you mean water condensates?

Dr. White: In liquid.

Mr. Ramsburg: We have turned out gas of approximately 560 B. T. U.'s, which has no condensates other than water, having been stripped of its Benzols and Napthalene and we find there is nothing remaining but condensed water. I do not know how much water you get out of natural gas but I imagine your gas is not saturated but when cooling it down to the freezing point you do get some water. I think you would have about the same problem with coke oven gas that you have with natural gas.

Mr. J. H. Maxon: It might be of interest to the members to hear something drawn from practice rather than theory. In the past six months I have operated a plant in a town served with natural gas where we have mixed coke oven gas and natural gas in the proportion of fifty-fifty and the product has gone to industries through separate mains and the average B. T. U.'s would run approximately eight hundred and we have had no trouble. I have carried that out for six months this last winter in a city where the industries could not be served with natural gas and we gave them manufactured gas — coke oven gas enriched with natural gas.

President Oliphant: Does anybody else desire to ask any further questions? I would like to ask Mr. Maxon, the plant you refer to, is that an artificial plant or was it originally built for natural gas?

Mr. Maxon: The manufactured was made in ovens of the Klonne type similar to the ovens shown in the pictures exhibited by Mr. Ramsburg and the ovens are about nineteen feet long, seven high and nineteen inches wide.

PRESIDENT OLIPHANT: I was referring more particularly to the piping system and the means of distribution throughout the town and to the industries that you refer to.

MR. MAXON: The piping system was a belt line used ordinarily for the distribution of natural gas to low pressure system of natural gas mains it being a pumping line where the gas was pumped from the plant to twenty factories that received it for their fuel supply.

MR. RAMSBURG: In passing I might mention the fact that we have distributed coal gas in which you would expect a lot of trouble from Napthalene and other condensates but these condensates now have a commercial value which justifies the manufacturers in removing them from the gas. For instance, take the value of Napthalene which is twelve cents a pound and it is possible to get something over a pound from a ton of coal and at the same time keeping it out of the gas so as to eliminate any danger of trouble. I believe there will be no problem connected with the distribution of coke oven gas mixed with natural gas on account of the coke oven gas having any condensible ingredients because it is going to pay very largely to take them all out by reason of their commercial value and it would only be by gross carelessness or absolute wastefulness that any such material or condensate would find itself in the gas as delivered to the consumer.

MR. THOMAS R. WEYMOUTH: I would like to ask if in the manufacture of coke oven gas it is so arranged as to keep the gas entirely free from tar.

MR. RAMSBURG: It would have no tar in the gas after it has been through the tar extractors and the Benzol washers.

MR. WEYMOUTH: I can conceive of no reason why gases would not mix and stay mixed perfectly in spite of different gravities but the only possible problem that you can have would be those arising from the liquid condensation of gas which might condense if raised to a high pressure and then cooled.

MR. RAMSBURG: The coke oven gas will have no condensates down to zero other than water. It is perfectly easy and indeed it is best to take those out.

President Oliphant: Are there any other questions by any member of the Association?

Mr. Frank S. Wade: Supplementing the remarks made by Mr. Maxon and also some made by the other gentlemen, I might say, speaking from the experience we have had at Los Angeles, that I believe little trouble need be anticipated in the mixing of coke oven gas with natural gas and distributing the mixture through the general distribution system to domestic and commercial consumers. Out in Los Angeles we have been mixing oil gas — a low grade oil gas with natural gas.

In glacing down table three, which is a part of the paper presented by Mr. Ramsburg, rather hastily I may say that I think that the oil gas I refer to will compare very closely with the gas given here as "lean gas". I find that the gas has a B. T. U. of 530 and a specific gravity of about 38. We have been making gas in Los Angeles for about five or six years from oil and making a gas that runs about 520 B. T. U. and about 35 specific gravity and mixing that gas with natural gas running from a thousand to eleven hundred B. T. U.'s distributing the resulting mixture running about 800 to 825 B. T. U.'s with entire satisfaction and without any trouble whatever.

The problem, of course, will vary from straight natural gas to mixed gas and possibly on down to straight artificial gas which is another problem and introduces serious difficulties from the standpoint of utilization. But I do not think any trouble need be anticipated in the matter of mixing natural gas and manufactured by-product coke oven gas and distributing that mixture through the general distributing system.

Mr. Ramsburg: It looks to me as though the natural gas problem would eventually result in the building of by-product coke ovens at coal mines near the location of the the large gas companies. Under those conditions the gas company could take all they could get of the coke oven gas and transmit it as it is now being transmitted from the Bee-Hive district. The tar can be extracted and used commercially and the gas can go to the natural gas line. The coke can be sold for commercial purposes and where you have no market for it that portion of the coke could be turned into the blue water gas and mixed with the coke

oven gas which would give you about thirty-three to thirty-five thousand feet of gas per ton of coal ranging from 380 to 390 B. T. U.'s. Now, whether that will work out or whether that is too low to mix with natural gas is a problem which will have to be solved in the future. It looks, however, as though that were going to be the economical result of having gas mains near coal properties at the present time. For instance, the large gas feed mains of the Pittsburgh District will come right up near the coal mines and by-product coke ovens could be built on very cheap property and handled so that it would turn out practically from every coke oven handling twenty tons of coal a day you could get six hundred thousand feet of by-product coke oven gas ranging about 385 in B. T. U.'s and you would have the advantage of having a gas that was not full of nitrogen or introgenous substances such as producer gas but part of the coke could be used in heating the ovens in producing it. It looks to me as though that were the coming thing. I would not be surprised to see such plants in operation within the next five years.

MR. MAXON: I do not think Mr. Ramsburg need look to the future for a situation of that kind when we recall the fact that during the war necessity compelled the adoption by Great Britain of a gas similar to the gas he described of 450 heat value and recently the Canadian authorities have authorized the manufacture and distribution of gas of 450 B. T. U. heat value that is made by the mixing of blue gas and coal gas about half and half, thus obtaining a gas of about 450 B. T. U. value. It certainly is a matter of the utmost importance at this time to have our regulatory bodies recognize the great economy of reducing the standard of heat value that now prevails. Natural gas men are going to be interested in this subject very much becauses of the declining supply of natural gas. It is of present great interest to all and all over the country you have it recognized that we are going to be able to satisfactorily distribute a much lower heat value gas than is now required and, as I say, in Canada that has been legally authorized, and it has been proven that appliances now on the consumers' premises can be easily fixed without any heavy expense in order to use 450 B. T. U. gas just about as well and perhaps more efficiently than they do

[illegible]

[illegible] ... a very interesting ... [illegible]

[illegible] take all of [illegible] Sundays and holidays and it [illegible] who are near such [illegible] Sunday [illegible] right out in the open [illegible] for in- [illegible] Pittsburgh district and [illegible] fume coming out of the stacks [illegible] that gas might be easily util- [illegible] particularly in the winter time [illegible] some profit to the steel com- [illegible] profit to the natural gas company. [illegible] further questions, gentlemen, [illegible] I wish to thank you on behalf of the [illegible] for the very able paper you have [illegible] interesting and instructive pictures and [illegible] the screen and for the valuable dis- [illegible] this not only on behalf of each [illegible] but personally (applause). [illegible] I thank you one and all for [illegible]

[illegible] The next order of business, gen- [illegible] program is the report of American Committee [illegible] Mr. F. M. Towl is Chairman. I believe [illegible] has the report and will read it.

[illegible] then read the following:

REPORT OF AMERICAN COMMITTEE ON ELECTROLYSIS

To the Natural Gas Association of America—

GENTLEMEN:

Your Committee appointed to represent the Association in the joint American Committee on Electrolysis reports the following:

The American Committee on Electrolysis met in Chicago on August 16, 1919, and arranged for the creation of a Research Sub-Committee, to be made up of one representative of each of the seven interests on the General Committee, and met in New York City on March 5, 1920, at which time it received reports from the various sub-committees, and discussed in great detail the special work of the Research Sub-Committee.

This Research Sub-Committee has engaged actively in technical investigations, both in the laboratory and in the field, for the purpose of securing needed information. It is also collaborating in all of the electrolysis work of the Bureau of Standards; has had ten Sub-Committee meetings, has a great deal of work under way and expects to make very substantial progress this coming year. The Research Sub-Committee is now studying pipe drainage, and has in mind particularly three questions, namely:

"Corrosive effects of current on high resistance pipe joints."

"Heating effects of power cable sheaths."

"Possibilities of gas explosions due to arcs where current flows on gas pipes or where differences of potential are set up between gas and water pipes or other structures."

Respectfully submitted,

FORREST M. TOWL,
THOS. R. WEYMOUTH,
SAMUEL S. WYER.

April 20, 1920.

After the reading of the above report Mr. Weymouth said:

Gentlemen, in addition to this report I am asked to state that the Sub-Committee appointed by the Gas Association in con-

a 600 B. T. U. gas and the suggestion that Mr. Ramsburg makes about putting all of the coal in gaseous form and getting a gas which might be enriched up to a little higher value in heat units by natural gas is one of the important matters that seems to me to be of very great interest at this time.

MR. RAMSBURG: Without having the question asked me, if I may take one minute more of your time there is one other matter that I would like to speak of.

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MR. RAMSBURG: It is rather interesting to note that one of the largest gas companies in the country has just made arrangements with the steel plants in its locality to take all of their output of coke oven gas on Sundays and holidays and it might be food for thought for some of you who are near such plants to know that when the steel plant shuts down on Sunday all of that gas is being wasted and burned right out in the open on Sundays and holidays. Take the by-product ovens for instance in the Youngstown district of the Pittsburgh district and you will find on Sundays a great flame coming out of the stacks all day Sundays and Holidays and that gas might be easily utilized it seems to me to advantage particularly in the winter time by the natural gas company with some profit to the steel company and with a great deal of profit to the natural gas company.

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SAMUEL S. WYER.

April 20, 1920.

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Gentlemen, in addition to this report I am asked to state that the Sub-Committee appointed by the Gas Association in con-

junction with the other members of the American Committee on Electrolysis has engaged Mr. Myerhelm of the A. F. Johnson Corporation as observer in co-operation with the Bureau of Standards in carrying on their research work. He has been engaged for the period of four months at the rate of one thousand dollars for the full time plus his expenses. I think that is all. I thank you.

PRESIDENT OLIPHANT: Gentlemen, you have heard the report of the Joint Committee on Electrolysis, if there are no objections it will be received, filed and spread upon the minutes of this meeting.

Mr. Way has a telegram to read.

SECRETARY WAY: Gentlemen we have a telegram from Mr. George B. Cortelyou, President of the American Gas Association, which reads as follows:

"Natural Gas Association, The Auditorium, Buffalo, N. Y.

"The Natural Gas Industry is indeed fortunate in having such a valuable aid as your Association which is to be congratulated upon the excellent work it is doing for the Industry. On behalf of the Executive Board and Membership of the American Gas Association extend best wishes for a successful convention and a word of encouragement for a continuation of your splendid efforts.

"(Signed) GEORGE B. CORTELYOU,
"President."

PRESIDENT OLIPHANT: Gentlemen, the next order of business is the Report of the Finance Committee. This report has been submitted and Mr. Way will read it.

SECRETARY WAY then read the following:

REPORT OF THE FINANCE COMMITTEE

Natural Gas Association of America.

GENTLEMEN:

Your Finance Committee herewith reports that the books and accounts of the Secretary and Treasurer have been duly audited by accountants under the direction and supervision of your Finance Committee:

The following is a condensed summary:

Balance April 30th, 1919	$14,508 71	
Receipts from all sources	37,605 55	
Total	$52,114 26	
Total disbursements	44,280 59	
Balance April 30th, 1920	$7,833 67	$7,833 67
Fourth Liberty Loan Bonds		$10,000 00
Amount due for 1919 Banquet		652 60
Amount due for Special Work		2,512 21
Cash Fund		500 00
Total Cash Assets		$21,498 48

Respectfully submitted,

L. B. DENNING,
T. O. SULLIVAN,
H. A. QUAY,
Finance Committee.

PRESIDENT OLIPHANT: Gentlemen, you have heard the Report of the Finance Committee, unless there is some objection it will be received, filed and placed in the record of our proceedings.

Gentlemen, I am sure it will be very pleasing to all of us to know that we have with us today Mr. E. G. Sievers of the United States Geological Survey, who has spent a great deal of time recently trying to get some advance sheets to be presented to this Association. Unfortunately they have been delayed in the mails. However, he has some very interesting slides which he will throw upon the screen and also will read to us from manuscript the paper which he has prepared for our benefit.

MR. E. G. SIEVERS: Mr. Chairman, Members of the Association and Guests; this paper being a recent addition to the program has not been published. Mimeographed copies have been made of the paper but unfortunately they were delayed by the Express Company so that they have not arrived as yet for general distribution. I shall have with the papers certain diagrams which will be illustrated by lantern slides just a little later; I will take that up a little later.

Mr. Sievers then read the following paper:

NATURAL GAS PRODUCTION AND CONSUMPTION IN THE UNITED STATES

By E. G. Sievers

U. S. Geological Survey, Washington, D. C.

INTRODUCTION

The great and growing interest in the supply of natural gas and the apprehension as to its possible early exhaustion make it desirable to obtain more complete records of its production and consumption. The task of collecting statistics of the natural gas industry is difficult. In fact, complete statistics of the production and consumption have not yet been obtained. The difficulty of obtaining them is due to many causes. One cause is the complex relations between the producers and the distributors in different States and the lack of records covering all the many years of production. Another is the fact that considerable gas that is utilized directly at the wells for heating, lighting, and power and for other purposes is not measured. In many places, too, gas has been sold at a flat rate or on a royalty, methods of sale that prevent the determination of the amounts actually produced. Furthermore, the lack of adequate gauging appliances throughout the industry has made it impossible to obtain the records which, if obtained, would have been invaluable in the work of preparing more accurate statistics. The statistics here given are therefore only approximately correct.

As our supply of natural gas is declining, a more careful scrutiny should be kept over it, and in this work there can not be too much cooperation. If the industry will keep in close touch with the United States Geological Survey the statistics of natural gas can be made much more complete. The Survey endeavors to compile these statistics and to place them before the public in the quickest possible way, but the prompt co-

operation of the producers is essential to early publication of the results.

The information given in this paper is not new to those who are engaged in the natural gas industry. Most of the facts here presented have been stated in the Geological Survey's annual publications, but as the condition in the industry is now critical a digest of the records, epitomizing its activities, should be of value.

The term "production" has been used by the United States Geological Survey to indicate only the quality of natural gas commercially utilized. It does not include the large quantity that escapes from the wells without performing any service and is thus wasted. The total "production" for the country is in fact the same as the "consumption," but the interstate transportation of natural gas gives the two terms a different meaning as applied to the individual State. The term "production" as applied to a State signifies the output of gas in that State irrespective of its place of consumption, and the term "consumption" signifies the gas utilized in a given State irrespective of its place of production.

The term "value" as used by the United State Geological Survey, invariably designates the market value of the natural gas at the point of ultimate consumption, not at the point of production, no account being taken of intervening purchases and sales.

PRODUCTION

It is of interest to look back over the years covered by the statistics compiled by the United States Geological Survey and to review some of the outstanding features of the natural gas industry, the changes that have been made, and the results of these changes. Although natural gas is a unique and unrivaled fuel, the history of its production and utilization has not been thoroughly studied. Statistics of the value of the natural gas produced in the United States were compiled as far back as 1882, but statistics of the production and consumption prior to 1906 are not available. According to the available statistics the value of the natural gas produced from 1882 to 1918, inclusive, was approximately $1,574,775,000. In the 13 years

from 1906 to 1918 the quantity produced and consumed was approximately 7 1/3 trillion cubic feet. Although this total is only approximate, it gives at least some conception of the volume of natural gas produced during the 24 years from 1882 to 1906. This total, however, includes only the gas of which there is some record, and if to this total there could be added the enormous quantity that was completely wasted, the resulting figures, which would represent the quantity actually taken out of the ground, would be enormous. (Figure 1).

In 1906 the production was 388,842,562,000 cubic feet. In 1918 it was 720,981,141,000 cubic feet, an increase of 86 per cent during 13 years. The annual increase in production was regular until 1916 and 1917, when there was a marked increase stimulated by the war. The peak of the production of natural gas in this country was doubtless reached in 1917 and was followed by a decline, which probably continued during 1919. The statistics compiled by the Geological Survey indicate a decrease in production of 9 per cent in 1918, which was apparently due to a rather marked decrease of production in West Virginia, Oklahoma, and California. (Figure 1).

The Survey's statistics are compiled from returns made by the producers and distributors and from any other sources that may afford the information desired. As many of the producers made no reports estimates of their production had to be made, and some of these estimates may have been based on somewhat unreliable sources. The figures given for 1918, however, are the best now available. A comparison of the Survey's statistics for 1918 for some of the States with those compiled by the States themselves shows some discrepancies. These discrepancies will be studied further with the assistance of the State officials, but the best that can be done at this time is to list them as they stand and make corrections later. Comparisons that have been made, however, show the agreements and the differences indicated below.

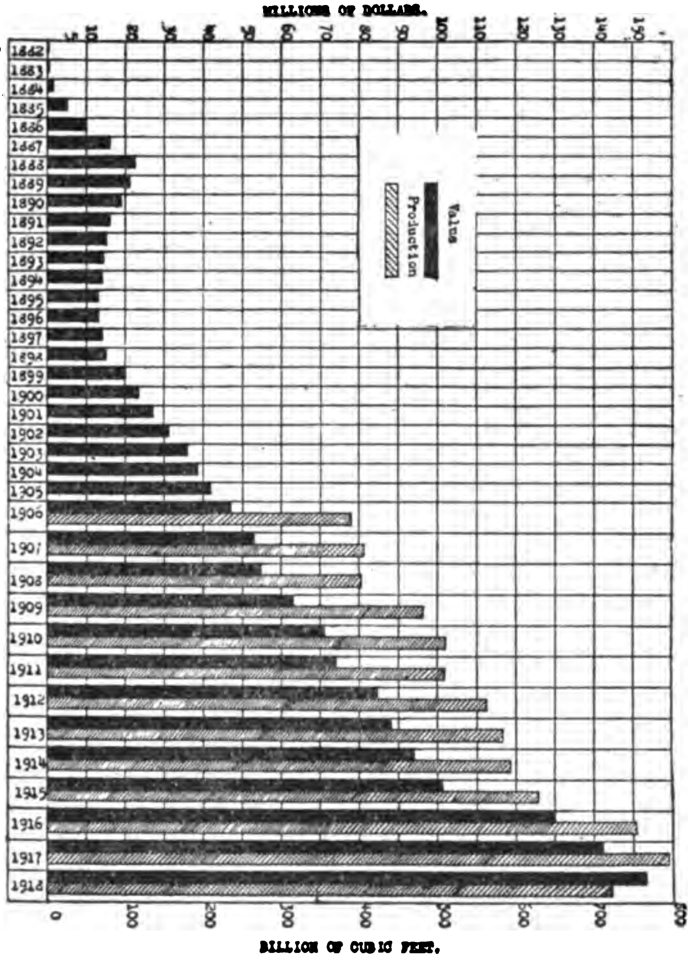

FIGURE 1. Diagram showing the annual production and value of natural gas in the United States.

State	*Records of U. S. Geological Survey.* Compiled from data obtained from producers	*Records of the State.* Compiled by State Commissions.
West Virginia.	Decrease from 1917 about 24%	Public Service Commission of West Virignia gives by telegram 2.4% decrease from July, 1917, to July, 1918. Dr. I. C. White, State Geologist, of W. Va., states in telegram that he considers Survey's figure approximately correct.
Oklahoma	Decrease from 1917 about 9%..	C. W. Shannon, Director, Oklahoma Geological Survey, in a telegram, substantiates this percentage of decrease.
California	Decrease from 1917 about 19%	4½% increase, according to telegram from Fletcher Hamilton, of the California Mining Bureau.

As statistics of actual production are not available for years prior to 1906 the only means of estimating the production before that year is the value assigned to the natural gas produced. From 1882 to 1888 there was a rise in value, and after 1888 there was a gradual decline until 1896. In 1897 there was again an increase. A gradual increase was maintained until 1918 with the exception of slight fluctuations during 1908, 1910, 1913, and 1914. (Figure 1).

In the natural gas industry, as in some other industries the sources of supply naturally shift from time to time owing to the depletion of some fields and the discovery of others. As the wells in the older fields decline new areas are explored and developed, so that in time the bulk of production may be concentrated in another region.

In 1906 natural gas was produced in 17 States and in 1918 in 27 States, but in many of these States, although gas was found, its commercial production is practically negligible. The bulk of the gas produced has come from West Virginia, Penn-

sylvania, Oklahoma, Kansas, Ohio, California, and New York. (Figure 3).

West Virginia made remarkable gains from 1908 to 1917, when it reached its maximum output. The increase in Oklahoma, although very much less in actual quantity than in West Virginia, has been very similar in proportion. Oklahoma also reached its peak in production in 1917. Kansas attained its largest production in 1908, after which it showed a decline until 1914. From 1914 to 1918 the production in the State has been stable. Pennsylvania and New York both show but slight fluctuations in production. Pennsylvania also decreased slightly in 1918. Ohio's production varied little from 1906 to 1913 but increased during 1914 and 1915. From 1915 until 1917 it decreased, but in 1918 it again increased. (Figure 2).

The total acreage including reserves that produced natural gas in 1906 was 5,244,943, but by 1918 the acreage had increased to 14,575,457, a gain of 178 per cent. At the end of 1889, 776 wells were producing natural gas, but at the end of 1918, 40,354 wells were producing, an increase of 5,100 per cent. The annual increase in productive wells has been remarkably steady. (Figure 4).

CONSUMPTION

As already noted, the lack of gauging appliances at the source of production has made it impossible to get complete statistics of production, and consequently the statistics must be based on consumption. As the total production reported is obtained from statistics of qualities commercially utilized, "total production" is synonymous with "total consumption." The fundamental problems of the industry lie in the processes of utilization, and there the first steps must be taken to remedy some of the present unfavorable conditions. Conservation might be mentioned, in this connection, because the largest waste occurs in the homes of consumers and not in transportation. Much could be said here on conservation, but it is no part of the object of this paper to discuss this problem for it is being treated exhaustively by others.

In 1906 the consumption of natural gas in the United States was 388,842,562,000 cubic feet. Thirteen years later,

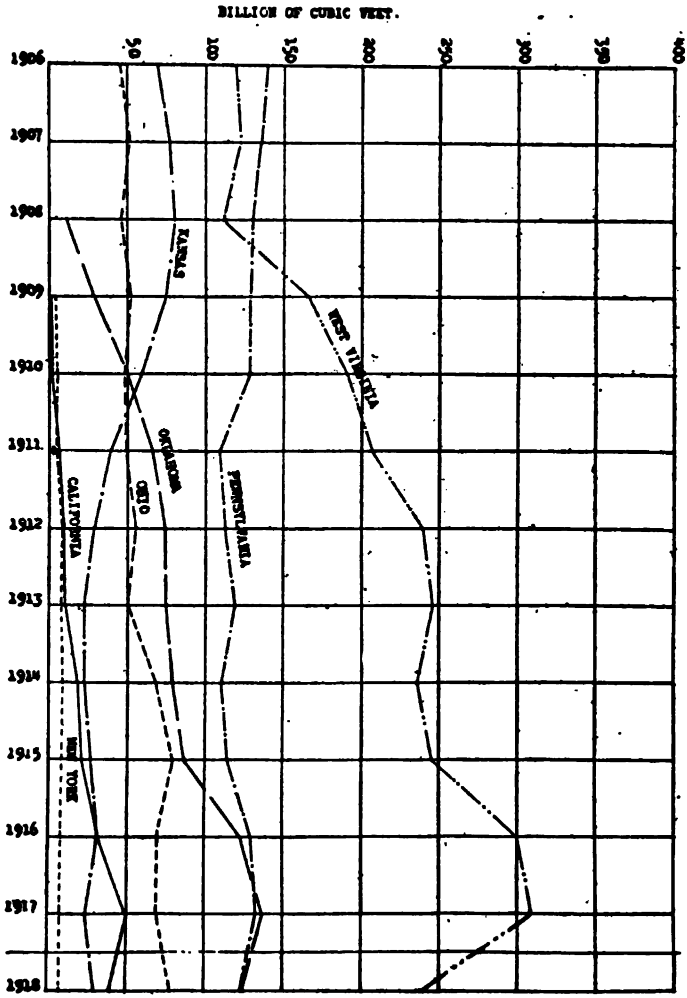

FIGURE 2. Diagram showing by principal States natural gas production in the United States from 1906 to 1918.

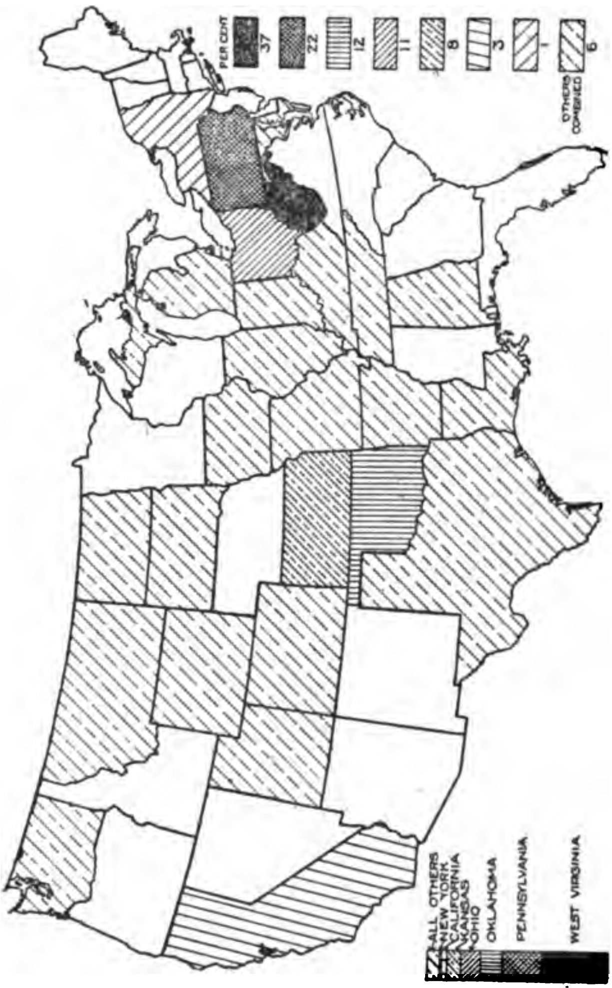

FIGURE 3. Map of United States showing by states the percentage of natural gas produced from 1906 to 1918.

in 1918, the consumption was 720,981,141,000 cubic feet, an increase of 86 per cent. In 1906 the quantity of gas consumed in the industries was 72 per cent of the total and the quantity consumed for domestic use was 28 per cent. In 1918 the industries used 62 per cent and domestic consumers 38 per cent. The industrial consumption increased 60 per cent and the domestic consumption increased 145 per cent from 1906 to 1918. Approximately two-thirds of the naturai gas consumed annually

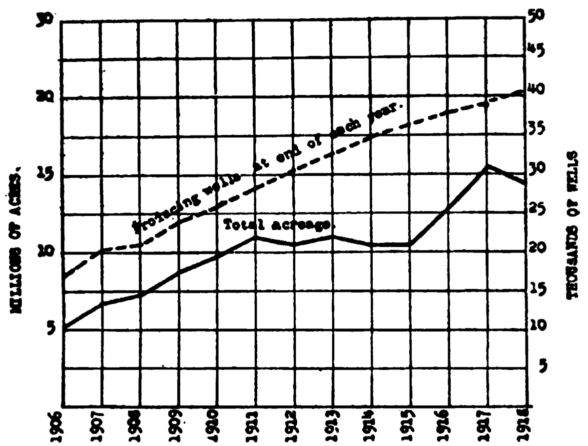

FIGURE 4. Diagram showing total acreage and number of producing wells at end of each year in the united States from 1906 to 1918.

goes into the industries and one-third into the homes for heating, lighting, and cooking. (Figures 5, 6 and 7). The table on page 5 shows the domestic, industrial, and total consumption of natural gas in the United States from 1906 to 1918.

The gas distributed to the industries, which amounts to two-thirds of the total quantity produced, has a smaller value than that used for domestic purposes, which amounts to one-third, showing that this unexcelled fuel is sold at a very low rate to industrial establishments. The number of private consumers that use one-third of the gas is more than 100 times the number of industrial consumers that use the other two-

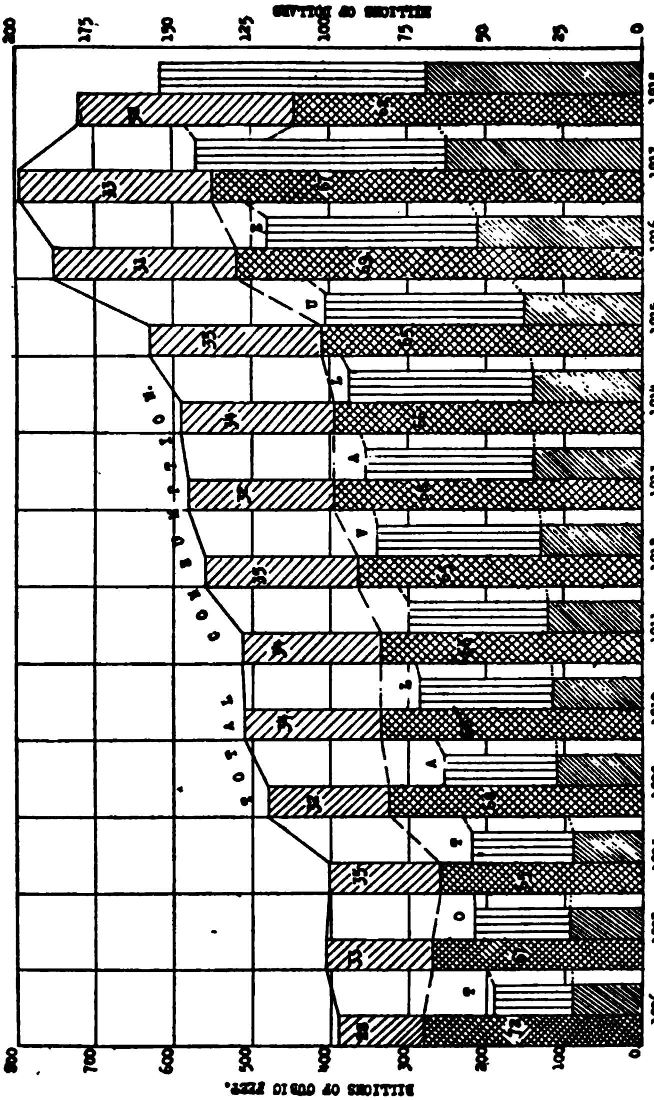

FIGURE 5. Diagram showing the quantity and value of natural gas consumed in the United States from 1906 to 1918. The first bar shows at the bottom the per cent of industrial gas and at the top the per cent of domestic gas consumed. The second bar shows in the same order the values.

thirds. The industrial establishments supplied with natural gas have averaged each year about 15,500, and the domestic consumers have averaged 1,700,000. During the 13 years from 1906 to 1918 natural gas was used by over 201,000 industrial

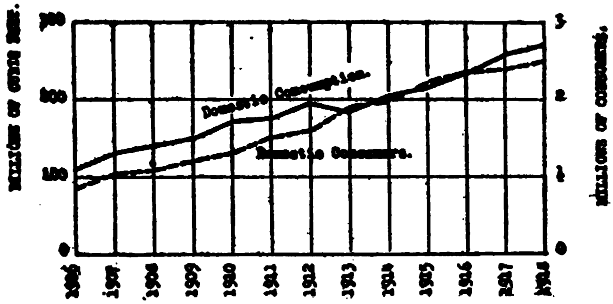

FIGURE 6. Diagram showing domestic consumption and domestic consumers in the United States from 1906 to 1918.

consumers and between 22 and 22½ million domestic consumers. The increase in industrial consumers has been more or less stable and the fluctuations have been small. The number

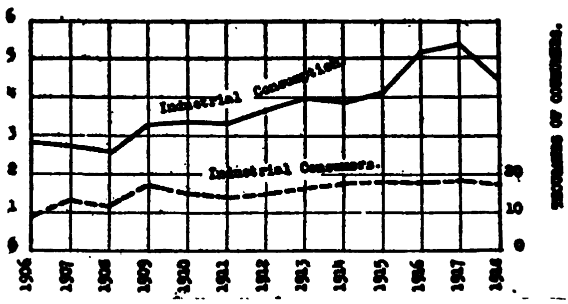

FIGURE 7. Diagram showing industrial consumption and industrial consumers in the United States from 1906 to 1918.

of domestic consumers has increased steadily from year to year and reached over 2½ million in 1918. The average consumption of natural gas of each domestic consumer during the 13 years from 1906 to 1918 was approximately 105,000 cubic feet, and

the average consumption of each industrial consumer for the same period was 2,428,000 cubic feet. (Figures 8, 9, 10, and 11).

The great fluctuation in the domestic consumption of natural gas from one season to another during the year has served to increase the use of natural gas in the industries. Naturally the consumption of fuel for domestic heating will not be steady but will rather change directly with the change of seasons, as is clearly shown by the actual sales of some of the large representative gas companies. The maximum domestic consumption in most places appears to be reached in January, and the minimum consumption in July and August. This peak load taxes the supply to its utmost capacity and causes the many shortages. In order to avoid such shortages the producers must naturally be prepared to supply this maximum demand. On the other hand, during the summer the sales drop off tremendously, and obviously the revenue is correspondingly reduced. It is estimated that three and one-half times as much gas is used during a cold month in winter as during a warm month in summer. During certain hours of an extremely cold day the rate of consumption is from ten to twenty times as great as during the corresponding hours of an extremely warm day. (Figure 12).

To counteract this fluctuating demand for natural gas for domestic use the producers must seek some source for a constant and steady demand and consequently most of the gas is applied to the industries. Most of the industrial plants operate day and night and their rate of consumption is therefore more or less steady, so that extreme peak loads are eliminated and the producers are provided with a surer return in revenue.

A curve showing the monthly industrial consumption, based on data submitted by a number of large producers, indicates that much more natural gas is used in the industries during the warmer months than during the colder months. However, this curve does not warrant definite conclusions. There are many fluctuations in the industrial consumption of natural gas, and these fluctuations are probably due to numerous factors. For instance, some State Public Service Commissions greatly restrict industrial sales between November 1 and May 1 in order to meet the domestic requirements. During the summer,

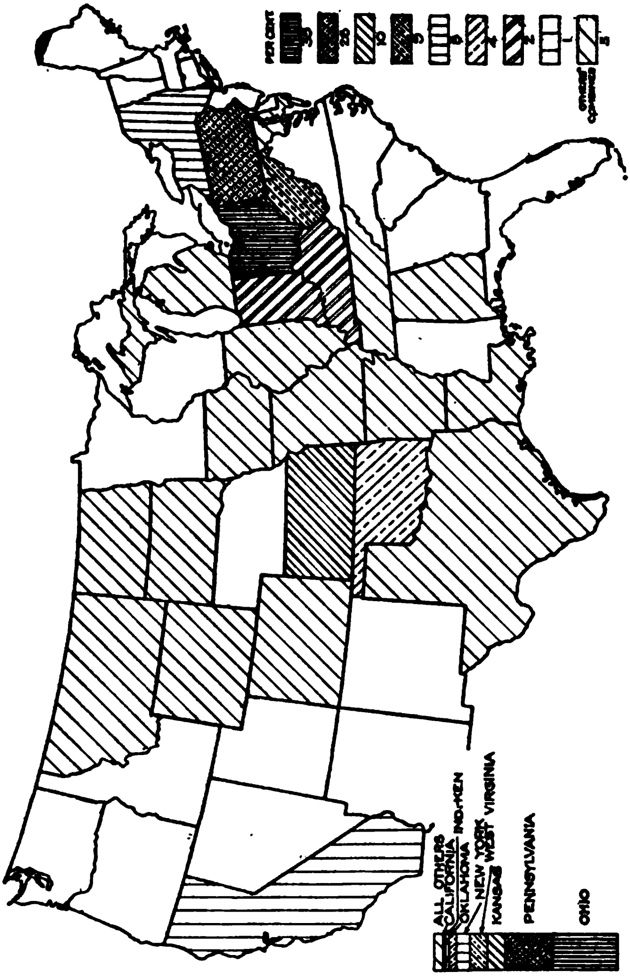

FIGURE 8. Map of United States showing by states the percentage of natural gas consumed for domestic purposes from 1906 to 1918.

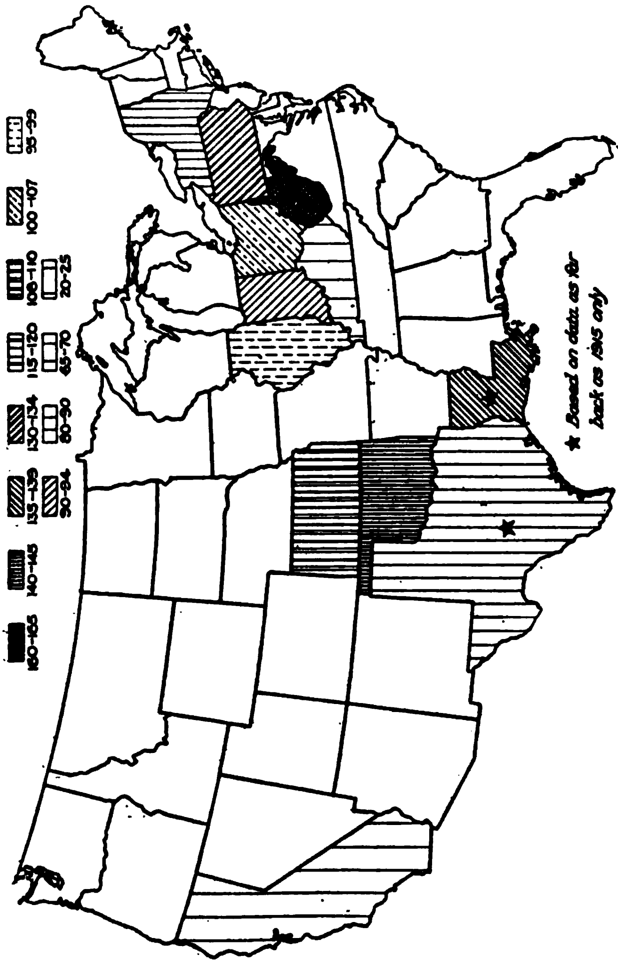

FIGURE 9. Map of United States showing the average domestic consumption of natural gas per consumer in the principal consuming states during the period from 1906 to 1918 in thousands of cubic ft.

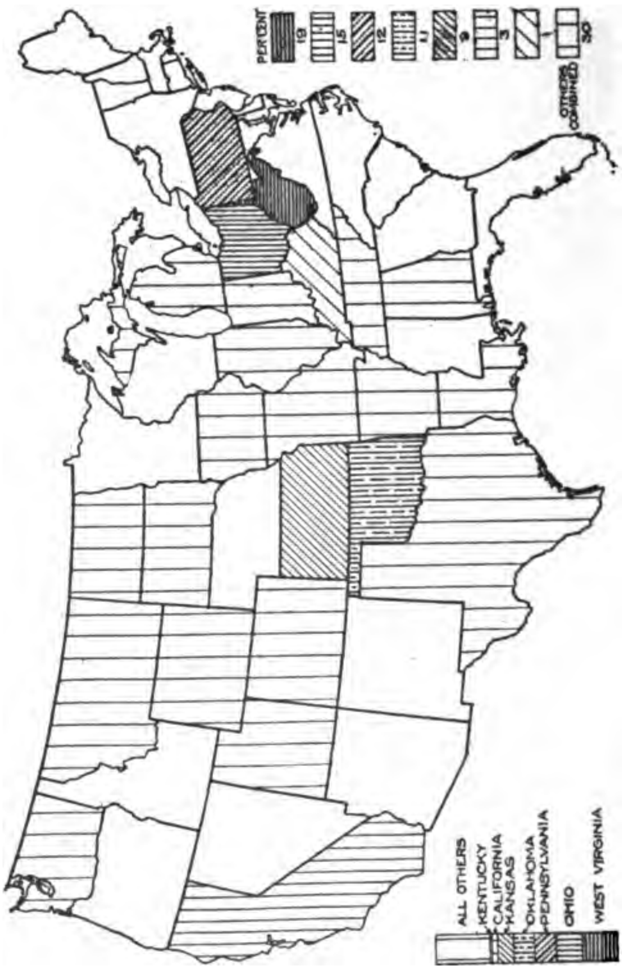

FIGURE 10. Map of United States showing by states the percentage of natural gas consumed for industrial purposes from 1906 to 1918.

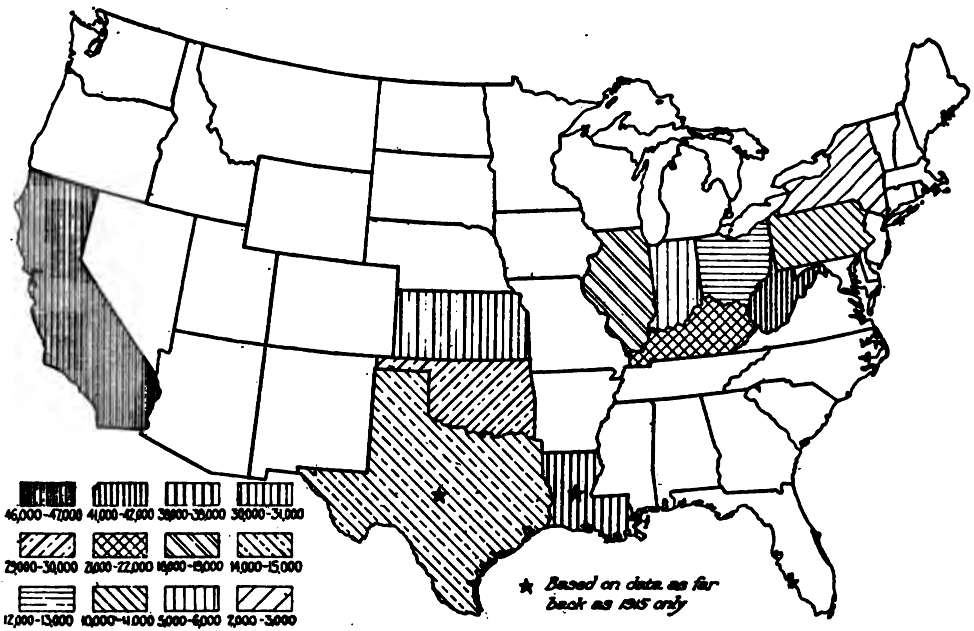

FIGURE 11. Map of United States showing the average industrial consumption of natural gas per consumer in the principal consuming states during the period from 1906 to 1918, in thousands of cubic feet.

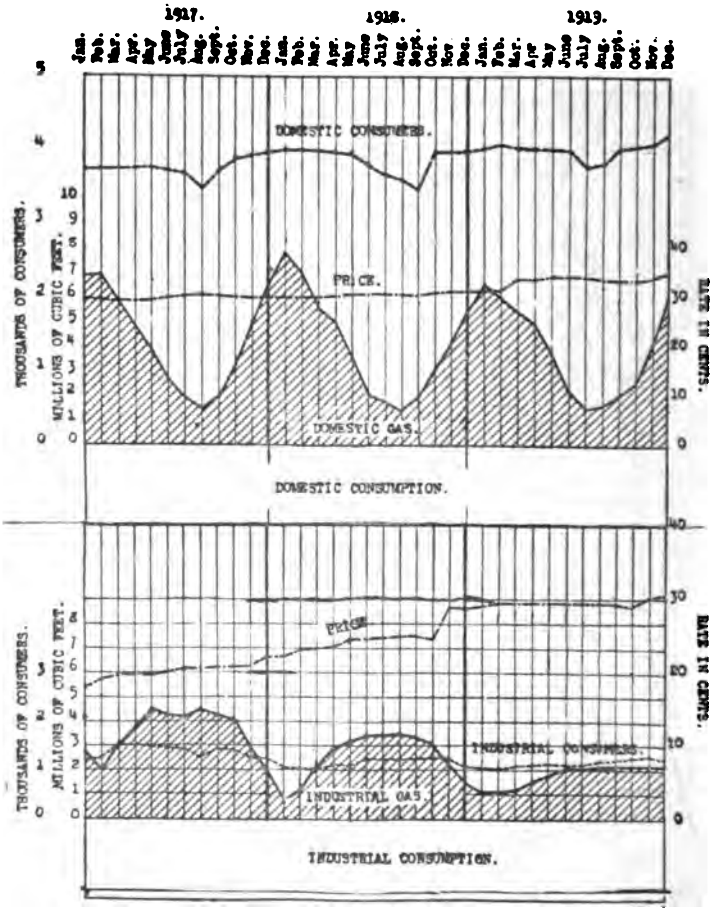

FIGURE 12. Diagram showing monthly fluctuations in domestic and industrial consumption from 1917 to 1919.

CONSUMPTION OF NATURAL GAS IN THE UNITED STATES

Year	Domestic			Industrial			Total	
	Percentage	Quantity (M cu. ft.)	Value	Percentage	Quantity (M cu. ft.)	Value	Quantity (M cu. ft.)	Value
1906	28	110,405,808	$25,149,097	72	278,436,754	$21,724,835	388,842,562	$46,873,932
1907	33	131,377,587	31,084,974	67	275,244,532	23,137,425	406,622,119	54,222,399
1908	35	140,583,732	33,215,041	65	261,556,998	21,425,333	402,140,730	54,640,374
1909	32	151,222,223	36,640,189	68	329,483,951	26,566,752	480,706,174	63,206,941
1910	34	169,823,030	41,473,903	66	339,332,279	29,282,255	509,155,309	70,756,158
1911	34	175,442,146	44,399,881	66	337,550,875	30,221,653	512,993,021	74,621,534
1912	35	193,454,802	50,960,883	65	368,748,650	33,603,074	562,203,452	84,563,967
1913	32	184,885,662	50,522,415	68	397,012,577	37,324,262	581,898,239	87,846,677
1914	34	203,104,358	56,960,052	66	388,762,375	37,155,472	591,866,733	94,115,524
1915	35	217,200,721	61,500,937	65	411,378,121	39,811,444	628,578,842	101,312,381
1916	31	235,380,764	67,385,360	69	517,789,489	52,842,108	753,170,253	120,227,468
1917	33	258,163,007	79,423,629	67	536,917,369	62,665,705	795,110,376	142,089,334
1918	38	271,092,298	85,003,742	62	449,888,843	68,549,818	720,981,141	153,553,560
Total	33	2,442,136,138	$663,720,103	67	4,892,132,813	$484,310,136	7,334,268,951	$1,148,030,239

when the demand for domestic gas drops and the lines are not required to work at their full capacity, more gas is again sold to industrial establishments. (Figures 12, 13, and 14).

A large quantity of gas is used for making carbon black.

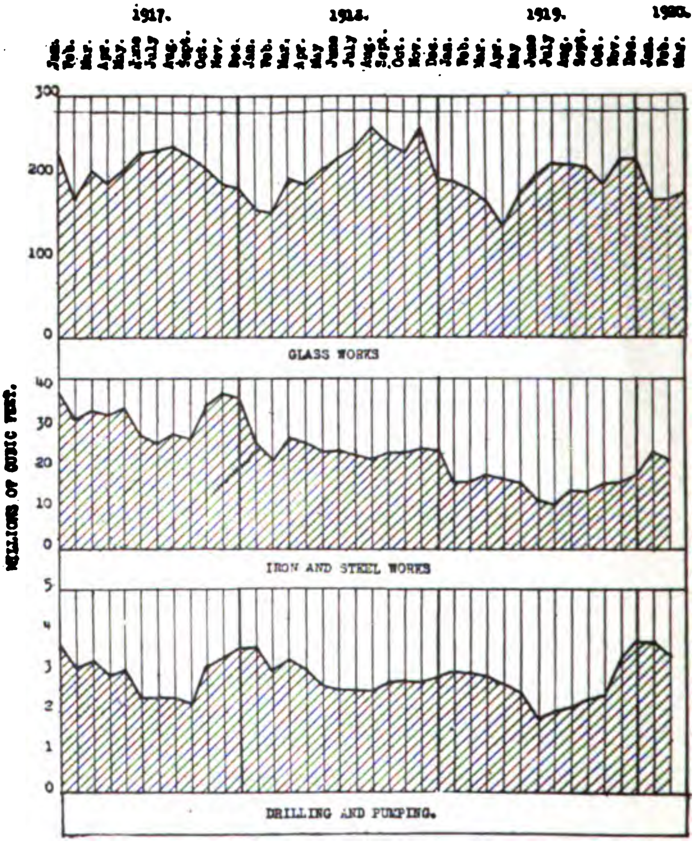

FIGURE 13. Diagram showing monthly fluctuations in the consumption of natural gas, in iron and steel plants, glass works, and in drilling and pumping.

In West Virginia, for example, between 30 and 40 per cent of the gas consumed industrially is used for this purpose. Investigations show that from one-half to two pounds of carbon black are extracted from a thousand cubic feet of natural gas. The

carbon black industry is mostly developed in West Virginia, Louisiana, Wyoming, and Oklahoma, but is also migrating to other States.

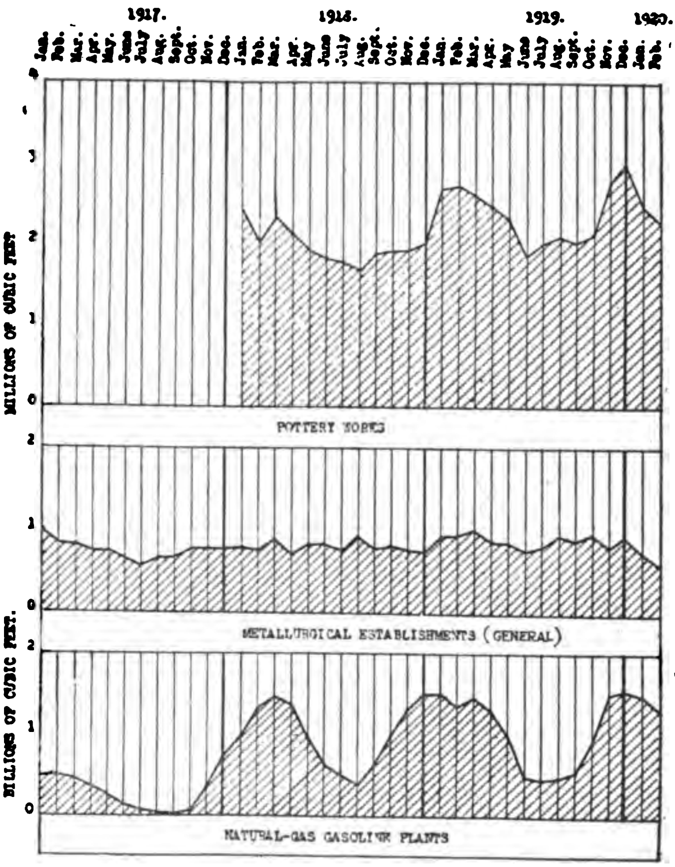

FIGURE 14. Diagram showing the monthly fluctuations in the consumption of natural gas, in metallurgical establishments in general, and in the manufacture of pottery and natural-gas gasoline.

Natural gas plays an important part in the production of electric power. The Geological Survey's statistics on power resources show that in January and February, 1920, approx-

imately one billion and a quarter cubic feet of natural gas were used in producing electric power in 14 and 15 States, respectively. The following table shows the consumption by States during these months, in cubic feet:

	January	*February*
Arkansas	155,222,000	154,330,000
California	179,563,000	190,449,000
Indiana	2,025,000	2,025,000
Kansas	76,283,000	68,560,000
Kentucky	....	2,757,000
Louisiana	68,510,000	63,947,000
Maryland	1,500,000	1,400,000
Montana	1,257,000	1,098,000
New York	72,579,000	57,834,000
Ohio	99,455,000	119,409,000
Oklahoma	275,926,000	250,514,000
Pennsylvania	49,937,000	27,038,000
Texas	48,227,000	48,307,000
West Virginia	227,900,000	207,691,000
Wyoming	3,300,000	2,860,000
	1,333,310,000	1,213,476,000

The extraction of gasoline from natural gas, which is not a process of consumption but an industry in itself, utilizes 450,000,000,000 cubic feet annually. In 1918 alone 282,535,550 gallons of natural-gas gasoline were produced, which was extracted from 449,108,661,000 cubic feet of gas. Strictly speaking, "consumption" generally means the complete destruction of a substance as a commercial resource in its utilization. In the natural-gas gasoline or casing-head gasoline industry, as it is commonly termed, the gas is merely treated for the extraction of gasoline and is then carried to the consumers, but as a very large quantity of gas is thus treated it should naturally be considered in connection with consumption.

As certain States have a more bountiful supply of natural gas than others, gas is piped from one State to another. In the Appalachian field West Virginia, Ohio, and Pennsylvania contain the largest supplies. West Virginia, the greatest interstate exporter of gas, piped out during the 13 years from 1906 to 1918, inclusive, about 1,619,000,000,000 cubic feet of gas, an annual average of 124,000,000,000 cubic feet, mostly to Ohio and Pennsylvania. Ohio is the greatest interstate importer, having piped in from other States during these 13 years about

807,000,000,000 cubic feet. Pennsylvania piped in approximately 625,000,000,000 cubic feet, and New York 126,000,000,000 cubic feet. Oklahoma, the largest interstate exporter outside of the Appalachian field, pipes out annually between 15,000,000 and 20,000,000 cubic feet. Although some of the gas piped in is piped out again, these figures give at least a general conception of the magnitude of the interstate natural gas industry. About 76 per cent of the natural gas produced during the 13 years from 1906 to 1918, inclusive, was consumed in the States where it was produced; the remaining 24 per cent was consumed in the States where it was not produced. (Figure 17).

The price of natural gas is of interest not only in itself, as a source of revenue to the seller and of expenditure to the buyer, but bears directly upon problems of conservation, for a low price tends to make waste negligible. During the 13 years from 1906 to 1918, inclusive, the average price of natural gas, as shown by the total quantity and value of the gas consumed, increased from 12.1 cents to 21.2 cents a thousand cubic feet, a very small increase for so long a period, especially in view of the great increase in the price of other fuels. During the same period the average price of natural gas sold for domestic use increased 8.7 cents a thousand cubic feet and the average price of that sold for industrial use increased 7.4 cents. These small increases show that the prices of natural gas have been relatively stationary, entirely out of accord with the increase in the prices of other commodities. (Figure 15.)

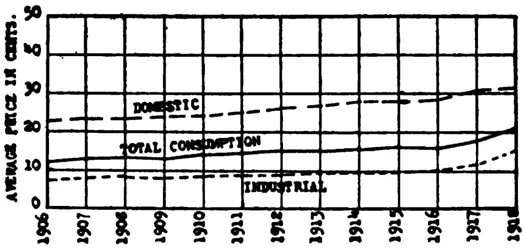

FIGURE 15. Diagram showing average prices of the total quantity of natural gas consumed, and of the domestic gas and industrial gas consumed in the United States from 1906 to 1918.

Statistics collected from 935 towns in 15 States show that most of these towns have a rate ranging from 31 to 40 cents. Out of these 935 towns 713 have a flat rate, 125 a sliding scale downward, 84 a sliding scale upward, and 13 employ other methods. In 451 towns a minimum charge is made, which is

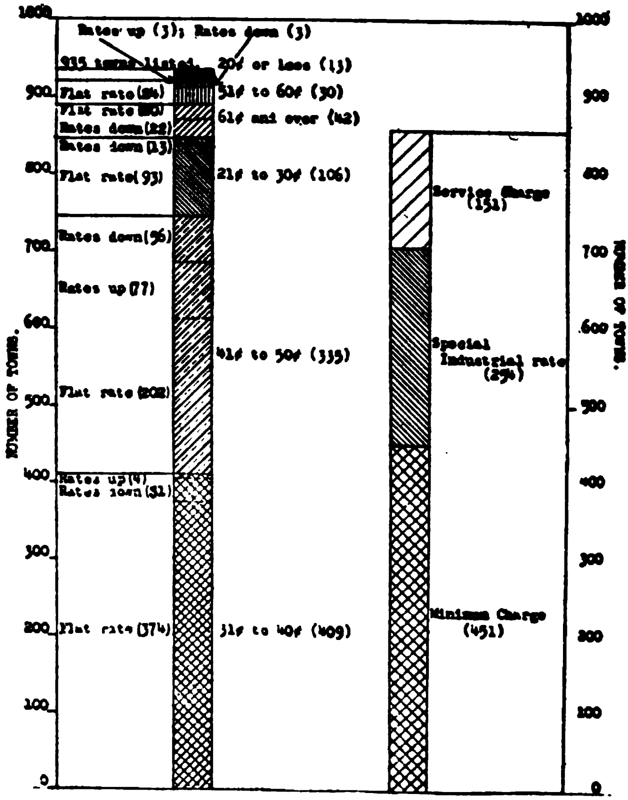

FIGURE 16. Diagram showing the natural gas rates in a large number of towns in 15 states using natural gas.

generally the price of 1,000 or 2,000 cubic feet. A special industrial rate is charged in 254 towns and a service charge is made in 151 towns. This service charge, or "readiness-to-serve" charge, is added to the monthly bill as shown by the meter readings and is intended to cover overhead and other expenses.

The charge ranges from 25 cents to $1 a month. Though the 935 towns furnishing the statistics include only about 40 per cent of those that use natural gas they nevertheless show the general tendency. (Figure 16).

The most significant point in a comparison of the values of mineral fuels is the very slight and very regular increase in the value of natural gas as compared with the large increases in the value of coal, coke, and petroleum. In 1917 the value of coal alone was greater than the value of natural gas during the whole period from 1906 to 1918. During this period natural

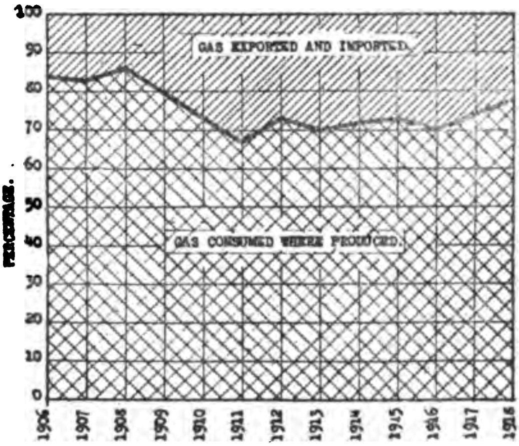

FIGURE 17. Diagram showing the percentage of natural gas annually consumed where produced, and exported and imported in the United States from 1906 to 1918.

gas increased in value 86 per cent, whereas coal increased 256 per cent, coke 317 per cent, and petroleum 661 per cent. (Figure 18).

The low price of natural gas is of course no criterion of its actual value as determined by its usefulness. This fuel, which is practically unexcelled in all its uses, has always been sold at a low price because its supply is plentiful, and its low price has in turn made its consumers careless in its use, so that the history of its utilization is a history of years of appalling waste. The low price is therefore merely the result of the oper-

ation of the economic law of supply and demand. The supply has been great, and the price has consequently always remained small.

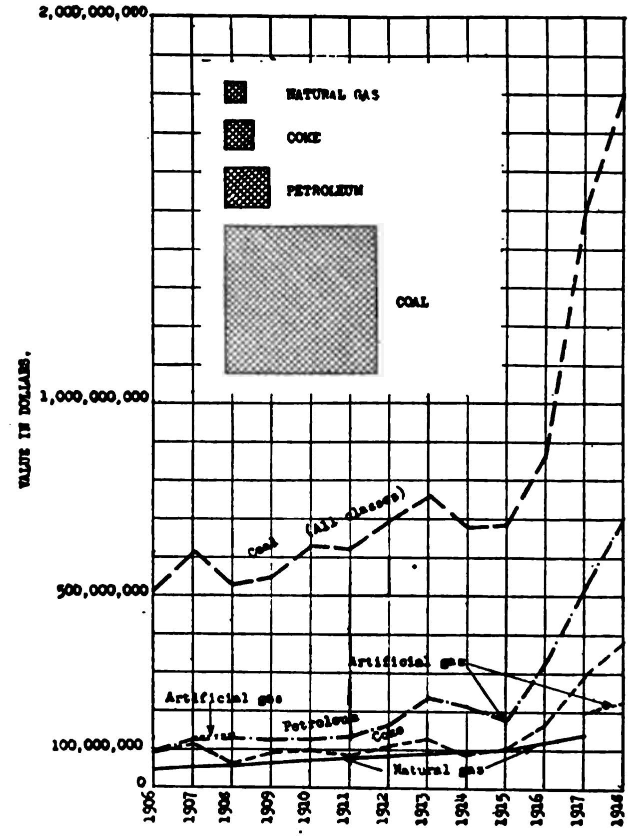

FIGURE 18. Diagram showing a comparison between the values of the mineral fuels from 1906 to 1918. The insert shows in proportion the total values of these fuels from 1906 to 1918.

Natural gas is a commodity of public utility, and its price therefore depends somewhat on the wishes of the public as expressed through its representative bodies, the different public utilities commissions. It is clear that the unexcelled usefulness of natural gas is not indicated by the price at which it has been

marketed, and this fact accounts for the regularity of the curve showing the value of natural gas produced as compared with

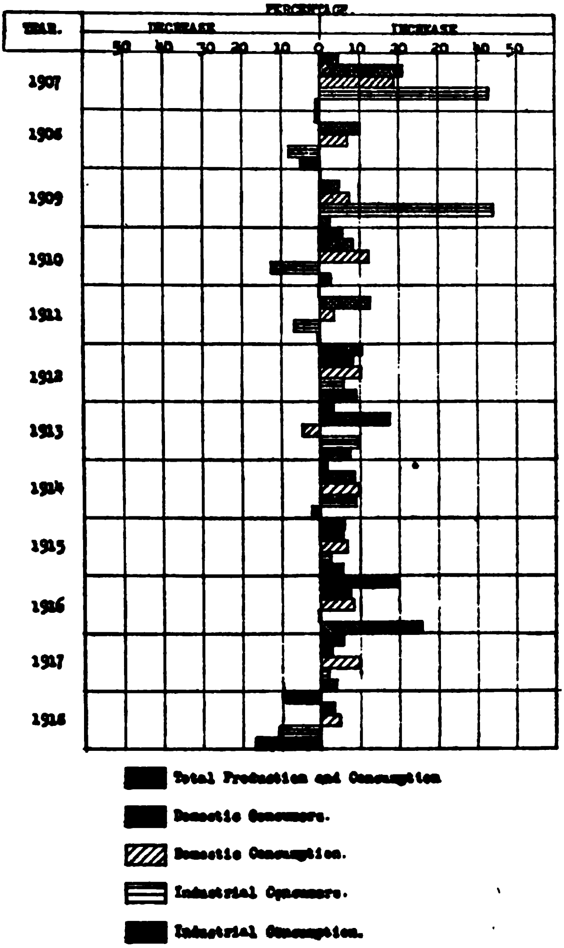

FIGURE 19. Diagram showing the annual percentage of increase and decrease in the natural gas industry in the United States from 1906 to 1918.

the curves showing the value of coal, coke, petroleum, and artificial gas produced.

As natural gas and artificial gas are similar substances they

are more nearly comparable with each other than with other fuels. The following table shows the essential features of the natural gas and artificial gas industries. The consumption of natural gas during 1908, 1912, 1915, and 1917 was roughly 2½ times that of artificial gas, but the value of the artificial gas was about 75 per cent more than that of the natural gas. In other words, though the quantity of natural gas consumed was about double the quantity of artificial gas, its value was only half that of the artificial gas. Similarly the price of artificial gas during these years averaged about 4½ times that of natural gas.

COMPARISON OF STATISTICS OF NATURAL GAS AND ARTIFICIAL GAS

	Natural Gas	Artificial Gas
Consumption in 1908—M cu. ft.	402,140,730	156,909,310
Consumption in 1912—M cu. ft.	562,203,452	212,391,168
Consumption in 1918—M cu. ft.	628,578,842	266,204,248
Consumption in 1917—M cu. ft.	795,110,376	342,151,129
Value of gas consumed in 1908	$54,640,374	$133,571,122
Value of gas consumed in 1912	$84,563,957	$148,282,725
Value of gas consumed in 1915	$101,312,381	$173,832,132
Value of gas consumed in 1917	$142,089,334	$195,031,424
Average price in 1908.........	$0.1315	$0.851
Average price in 1912.........	$0.1504	$0.698
Average price in 1915.........	$0.1612	$0.653
Average price in 1917.........	$0.1787	$0.570a*
Increase in consumption, 1908-1912—M cu. ft........	160,062,722=39.8%	55,481,858=35.4%
Increase in consumption, 1912-1915—M cu. ft........	66,375,390=11.8%	53,813,080=25.3%
Increase in consumption, 1915-1917—M cu. ft.........	232,906,924=41.4%	75,946,881=28.5%
Increase in value, 1908-1912...	$29,923,583=52.9%	$14,711,603=11.0%
Increase in value, 1912-1915...	$16,748,424=19.8%	$25,549,407=17.2%
Increase in value, 1915-1917...	$40,776,953=40.2%	$21,199,292=12.2%
Number of States producing gas in 1908.................	22	49
Number of States producing gas in 1912.................	22	49
Number of States producing gas in 1915.................	23	49
Number of States producing gas in 1917.................	23	49

*a** Drop in price due to increased commercial consumption of coke-oven gas, which brings only a small price.

In its wealth of this unrivaled resource the United States has held a unique position among the nations of the world. The output of natural gas in this country has been approximately 95 per cent of the total production of the world. Canada is next in rank. In this respect we are monopolists of natural gas as Russia is of platinum, Germany of potash, and Chile of nitrate.

A composite diagram showing the world's production of natural gas and the present known natural gas fields would show a tremendous concentration of this fuel in the United States. However, in time there may be a greater stimulation of the production of natural gas in other countries, especially in regious where petroleum is being developed, though the discovery of extensive gas fields in such countries is perhaps unlikely at this time.

GENERAL SUMMARY

The outstanding features of the natural gas industry in the United States to the end of 1918 may be summarized as follows:

1. The production of natural gas gradually increased from 1906 to 1917 but declined in 1918, so that the peak may have been reached in 1917, and the supply may now be approaching exhaustion.

2. The greatest producers of natural gas, named in the order of quantity produced, have been West Virginia, Pennsylvania, Oklahoma, Ohio, Kansas, California, and New York.

3. The number of producing wells increased 135 per cent since 1906 and was about 40,500 at the end of 1918.

4. The area of natural-gas land increased 177 per cent since 1906; the total area in 1918 was about 14,500,000 acres.

5. The average annual consumption of natural gas for domestic use has been about one-third of the total consumption, and the average annual consumption for industrial use about two-thirds.

6. The total amount received for the two-thirds consumed for industrial use is smaller than that received for the one-third consumed for domestic use, a fact which indicates that the industrial gas was sold at very low rates.

7. Over 2,500,000 domestic consumers and more than 16,500 industrial consumers now use natural gas, an increase since 1906 of 187 per cent in the domestic class and of 83 per cent in the industrial class.

8. The consumption of domestic gas reaches its maximum about in January and its minimum between July and September.

9. To a large extent the industrial consumption reaches its maximum in summer and its minimum in winter, owing to the decrease of the domestic demand in summer, which leaves more gas available for industrial use.

10. The average annual domestic consumption per consumer from 1906 to 1918 was 105,000 cubic feet, and the average industrial consumption per consumer from 1906 to 1918 was 2,428,000 cubic feet.

11. The average price of domestic gas is between 30 and 40 cents a thousand cubic feet; that of industrial gas is between 25 and 30 cents.

12. The increase in the price of natural gas has been very small and regular as compared with the increase in the price of artificial gas, coal, coke, and petroleum.

13. About 24 per cent of the total natural gas consumed in the United States is not consumed in the States where it is produced but is piped to other States.

14. The United States produces about 95 per cent of the natural gas produced in the world and thus has a monopoly of this resource, as Russia has a monopoly of platinum, Germany of potash, and Chile of nitrate.

DISCUSSION

PRESIDENT OLIPHANT: Gentlemen, I am sure we have all appreciated Mr. Sievers' paper and the explanation of the slides upon the screen for it has been most instruction. Are there any questions or is there any discussion that you would like to enter into? I would like to ask Mr. Sievers one question. I may not be exactly right in the figures as it was dark during the showing of the slides and I did not make a note of the accurate figures,

but Mr. Sievers I understood you to state that from 1906 to 1917 the value of natural gas had increased eighty-five per cent or approximately that.

MR. SIEVERS: As I recall the figures it was eighty-six per cent.

PRESIDENT OLIPHANT: Upon what is that value based?

MR. SIEVERS: That is the total money value of natural gas as determined by the producer; we get reports from the producer.

PRESIDENT OLIPHANT: That large increase was due to what? Possibly to the large amount of industrial gas being sold at a very low price in the earlier years?

MR. SIEVERS: Yes.

PRESIDENT OLIPHANT: That is what I wanted to get at, thank you.

SECRETARY WAY: I would like to ask a question, Mr. Sievers. In arriving at the percentage of eighty-six I assume that your first figure was based on a very low rate?

MR. SIEVERS: Yes.

SECRETARY WAY: Eight, nine, ten or eleven cents?

MR. SIEVERS: Yes.

SECRETARY WAY: Do you mean by an increase of eighty-six per cent it would bring the price up say around sixteen or seventeen cents, is that correct?

MR. SIEVERS: Yes.

SECRETARY WAY: It really does not mean anything then does it as to the true commercial value of natural gas at this time?

MR. SIEVER: No, that is true. The percentages were computed on the basis of the total consumption and the value taken as of the first year and then the value say in 1918.

PRESIDENT OLIPHANT: Any further questions, gentlemen? Mr. Sievers, I want to thank you very much on behalf of the Natural Gas Association for your interesting and most instructive paper and the exhibition you have given us in the way of slides upon the screen and your explanations thereof.

Gentlemen, before we adjourn I wish to say that the Reading Iron Company, after we adjourn, wishes to show, in this hall on the screen, moving pictures of the steel and iron industry.

Now, do I hear a motion to adjourn? I want to suggest that we try to be here promptly tomorrow morning because we have a lot of reports to consider and two very important papers to discuss.

And thereupon, on motion duly seconded and carried, the Association adjourned until Thursday, May 20, 1920, at 10:00 o'clock A. M.

Proceedings

of the

Fifteenth Annual Dinner

held in the

Elmwood Music Hall
Buffalo, New York

on the evening of

Wednesday, May 19th 1920

BANQUET SESSION

WEDNESDAY EVENING, MAY 19, 1920.

After the serving of the Banquet Dinner and the concluding cabaret, which was interspersed with the Banquet, Toastmaster L. B. Denning, of Pittsburgh, Pa., said:

Mr. President and Gentlemen of the Natural Gas Association of America:

I want to remind all of you to please give as close attention and please be just as quiet as you possibly can, for I think you will quickly recognize the difficulties that any speaker will be under in attempting to address so large a gathering in this auditorium. For that reason please let us have just as much quiet as we possibly can.

I want to take this occasion to thank the members of the Association, through their representatives, and to say that I appreciate very much the honor of being chosen to preside over this dinner tonight. The thought comes to me that in the eleven years I have been attending Association meetings, we have reached a climax in this meeting tonight. I do not recall at any time having seen gathered together at any one time so many representative men connected with the natural gas industry as there are here tonight. It seems to me that Buffalo has done itself proud and that a very high mark has been set for the succeeding city next year to reach if it hopes to equal Buffalo. If they beat Buffalo, to use a street phrase, they have got to go some and get busy. (Applause.)

Now whenever I am called upon, on an occasion of this kind, to act in the capacity I am attempting to act tonight, I am reminded of a prayer which I heard some years ago given by an Italian friend of mine named Sam Morosco. Sam was a big North of Italy giant who talked with his hands and his feet and his head and his shoulders, and when Sam got really busy going, our shimmy friend, who was trying to entertain us a few minutes ago out there, couldn't hold a candle to him. (Laughter and applause.)

We had a big explosion down at Columbus and Sam happened to be one of the foremen on the job and it became a part of my duty to bring Sam into my office and question him about it and find out how it occurred. During the course of my investigation I said "Sam, were you hurt?" "No, only got-ta da burn-a da hand; don't like-a me blowed up-a dynamite." "Were you blown up by dynamite?" "Yes, me-a blowed up-a by dynamite." "How did it happen?" "We dig-ga da ditch and we put-ta in da dynamite, and da boss he say 'Get-ta da men back, get-ta da men back', and just then Boom-Boom, and da boss he say 'Sam, get-ta da men back, get-ta da men back; da dynamite not-ta all exploded yet', and then he say 'Sam, you dam' fool-a, get-ta da men back', and I say to da men 'shoo, shoo', and then he say 'Get-ta da men back queeck, queeck', and I turn-a and run-a like hell, and I say 'God-a Almight', save-a me if-a you can'." (More laughter.)

So that prayer comes to me on an occasion of this kind, and when I look into the faces of the members of this Association and realize the responsibility of my position, with Sam Morosco I say 'God-a Almight', save-a me if-a you can', because I am very likely to need saving before I get through. (Renewed laughter.)

Now, as I said a moment ago, Buffalo has done itself proud in the entertainment of this Association this year. A very great deal of the success of this meeting has been due to the untiring efforts of our out-going president, Mr. Oliphant. Our outgoing president, who, when he retires tomorrow, will be succeeded by the man to be nominated by the Convention at its next session, can well say "I have fought the good fight; I have kept the faith", and when he leaves and retires to the ranks he will carry with him the esteem, the admiration, the respect and the love of all of us. I am going to call upon our worthy President to make a few remarks to you, and I take great pleasure in introducing to you Mr. B. C. Oliphant, President of the Natural Gas Association of America. (Great and long continued applause.)

Mr. B. C. Oliphant, President of the Natural Gas Association of America, then said:

Gentlemen, it seems to me that I have been talking almost constantly for the last three days — possibly not so much as some others — so that I am only going to take a very few moments of your time. I feel that this is possibly the last occasion when so many of us will be together and I want to take advantage of the fact to thank you for your close attention, for your co-operation, for your hearty partnership in working with me this year and assisting in bringing out such an enthusiastic gathering of members of the Association in our beautiful City of Buffalo.

It has been rather a strenuous year. We have had rather difficult things to come up, but I want to say that every man in this organization has helped the organization and has helped me, and for the individual effort of each man I return to him my grateful thanks. Whether it is through advice or whether it is through putting his shoulder to the wheel with me and with the directors and with our worthy secretary, in trying to put matters over where they would come to a head, your efforts have been of the greatest aid. I think we have done some things this year that are worthy to go down in the history of our Association, not because I merely happened to be president of your Association this year, but because of the co-operation that we have had from all. (Applause.)

I am only going to just say a few words in conclusion. I hope you all have had and will continue to have a very pleasant stay in Buffalo, and I also wish to say, in justice to the municipal authorities of the City of Buffalo, that you owe to them a vote of appreciation for having given us the beautiful Convention Hall in which we have held our meetings in the City of Buffalo, for allowing us to erect a derrick on Lafayette Square, and for doing almost as we pleased in the City of Buffalo, and in addition giving to us tonight this beautiful Music Hall in which to hold our annual banquet; and I wish as a tribute to the municipal authorities of Buffalo and as recognition of their many hospitalities that you would all arise and give a vote of thanks to the City of Buffalo, to its City Council and to its Officials.

A rising vote of thanks was then had as above suggested, amid hearty rounds of applause.

TOASTMASTER DENNING: We have grown very much in the habit in these days, when we pick up our morning newspaper, of accepting every statement made therein as a statement of fact, sometimes not realizing that newspapers have as much trouble in verifying statements that they make as we have in ordinary everyday life. The business of advertising has grown to a very great extent. Some years ago it was considered very bad form for a public utility to take advantage of the newspaper columns to present its case to the public. However, during the past few years there has grown up a habit of presenting its case to the public through the columns of the press, until it has grown to be quite an extensive branch of advertising, and from my point of view and the point of view of the public utility man, there is no reason under the sun why a public utility, honestly and fairly conducted, rendering necessary public service, should not present its case to the public in the proper light and through the ordinary means, to the end that the public may be enlightened and may the better understand the difficulties surrounding the particular business and service rendered by the utility.

Now we have with us tonight a man who has devoted a great deal of time to the publicity end of public utility service and he will give you a talk upon publicity as relating to public service. I have the pleasure of introducing to you Mr. Roy Crandell, Publicity Expert of the Buffalo Public Utility Company. (Applause.)

MR. ROY CRANDELL then said:

Mr. Toastmaster and Gentlemen of the Convention:

Though introduced as an advertising man, I consider it is only fit and proper that I be present here at the throne with the high and mighty as a gas man, because I qualify as a producer (laughter). Last winter I made as many speeches as Mr. Heintz makes varieties of pickes — 57, to be exact. (More laughter.) And a brutally frank friend of mine told me that had President Oliphant been able to corral all of the noxious vapors and gases emitted at those 57 functions, then no consumer in the City of Buffalo would have had just cause to complain of a lack of supply or even of low pressure. (Great laughter and continued applause.)

If those credentials make our presence tonight permissable, I will pass on, and, in passing, admit that I do sometimes do some advertising. But I will try not to forget that I am merely here as a pinch hitter and not to take too much time that rightfully belongs to the real performer. (Great laughter.) You know it is the duty of the pinch hitter to step modestly forward, make a feeble, futile effort and then drop back below the horizon. (More laughter.) I shall soon do that praiseworthy thing. (Continued laughter.) About six minutes will see me gone (more applause), but in that time I hope to touch upon some of the high spots mentioned by the Toastmaster in presenting me to you. Before I do so I wish to say that your secretary is not to blame for this. He forced me on you. You can not blame him; he is simply well-meaning, but blundered. (Great laughter and applause.) He guessed all wrong because he thought you were going to be entertained. He said "You can speak on public utility publicity for about five minutes," thereby conveying to me his belief that I knew mighty little about publicity and nothing at all about utilities. And I am going to try to refute the concealed insult by putting the whole story into one paragraph, which would read like this: "The gravest crime of which a public utility can be guilty is unpopularity," because unpopularity is the offspring of secrecy and suspicion, and there isn't any excuse for a well-conducted public utility to be shrouded in secrecy or to have the finger of suspicion pointed towards it. (Great applause.) If there are any public utilities in any of the progressive cities that are still unpopular, it is because nature has been unkind or because the executives have missed a bet. (Great applause.)

There are many ways to overcome the unpopularity of the public service corporation. That is not theory. It has been proved so many times. But the unpopularity that some still maintain is due to the fact, as mentioned by the Toastmaster, that it was considered unethical for a public service company to carry its troubles to the people. What a mistake! What an awful blunder, to conceal from the people the story of the conduct of the utility that is absolutely dependent upon those people for its own prosperity, but that was the habit. The old-timers did not believe in it. They knew, or at least felt, that the fellow who

marched up and paid the bill once a month for gas or electricity ought to be satisfied with what he got and not talk back.

About a dozen years ago — oh, twenty years, say, there came a slight change; some of the public utility men began to wake up and they found that they were not popular. They were like the fat man, "nobody loved him". They began to try to guess why it was, because they knew they were doing the right thing, and then one of them came to one morning and said: "That which cuts us most have a double edge", so they sent for the advertising man and the publicity expert and began to tell their troubles, and they said, "What can we do?", and the early publicity man and advertising man who went to work for the presidents of the large utility companies had might tough going, because not only did they have to combat a hostile public opinion, but every morning they had to reconvince the boss that publicity was the proper specific. They had to march into his office and explain why the ad was so big, why it was so frank, and do a monologue on advertising and then, after an hour and a half, have him weakly say, "Well, I think it is a dam fool idea, but go ahead a little while longer". (More laughter and applause.)

And it was not only the good utility man that did it, but particularly was it the president of a public utility who was occasionally wont to zigzag a little, for I am not fool enough to face 1200 men who stay out after dark and try to tell them that all public utility men are pure, and that all corporations are lily white, because in the olden days there were some presidents and some general managers who would leave a black stain on anthracite. (Great laughter and applause.) And still they never were lonesome because there are black sheep in every flock. (Continued laughter and applause.)

Why, every now and then a banker stubs his financial toe, and, indeed, ever and anon, a broker is seen sowing his lonesome wild oats, and it is rumored that once upon a time there was even a sinful lawyer. (Long continued laughter and great applause.) And the public utility men were just plain, every day, run-of-mine, good citizens like bankers and brokers and lawyers and doctors and merchants, but they were more reviled than any other class of men because more misunderstood. They were scan-

dalously and shamefully attacked. Anybody could take a punch at a man at the head of a public utility company, or who had the words "Public utility company" branded on him. They were bright and glittering targets. I know whereof I speak. I served an apprenticeship of many years on some of the nation's leading ochre-tinted sheets, and many a spear have I sunk into the hide of a bigger, better man than I ever dared to be, and his only crime consisted of the fact that he was the successful head of a large public service company.

And I was not alone. There were thousands of reporters and editors who every day thanked God because he had declared it "open season" on all these fellows (more laughter and applause). No game laws guarded them. You could track them with dogs or follow them through the snow. The only thing in the world that the editor demanded was that we bring back their pelts. (Continued laughter and applause.)

How foolish it was. How foolish that these big men — because I maintain that a man must be a big man to be at the head of a public utility company in a large city, because he deals with many, many bothersome problems, and he has the public watching him every minute; and to occupy such a position a man must have brains and ability and he must be pretty clean, because there are so many people looking for the smudge upon them; but still they shot them in season and out of season and attacked them privately and publicly and did it so systematically that it became the universal belief that all public utility companies were led by wolves, and every man who, in his pride, submitted to these attacks patiently, did an absolute injustice to his stockholders, to himself and to his family, because they ruthlessly threw away the opportunity to give the enterprise in which the public had put its money a deservingly good name; and a public utility should be, as Caesar's wife, "beyond suspicion". It was the duty of those men to contradict every slanderous and ruthless attack and explain the true situation and let the public know the cold facts. They owed it to themselves and they owed it to their stockholder because a company's good name can be cashed. It means added dividends. The public is perfectly willing that a public service corporation which is popular through good service shall make

good profits, but it savagely fight the company that it hates, even though that company beg for the merest, scantiest justice.

Buffalo men who have been here for the last three years and have watched the action of the public in connection with our local transportation company can tell you whether that statement be true or not. So, conceding that they were attacked, that they were vilified by the press, that they were given a bad name, what remains to be done? Turn the same weapon the other way. There is no need today for a well-conducted and honest company to come before the public all of the time in such manner that half of the public believe that the actions of its president make the actions of the late Captain Kidd seem modest and restrained. (More laughter and applause.)

And the elixir has been found which can make the darkest things white; millions have been saved by it; it has recently been discovered by the managers of public utility companies; though discovered ages ago by the pickle princes and the pill potentates, it has remained for the public utility president or manager to only recently have discovered its saving qualities. What is it? It is "printer's ink", and I recommend to the management of all public utilities companies that they take large doses of it at frequent intervals. (Great applause.)

If you have a little story to tell, see that 60,000 people that buy your product have that story handed to them day by day. Get your prices right. See that your service is as good as possible. Call in the printer, and then BRAG. Don't brag too loud, but brag all the time. I say to you men that enough printer's ink will pull the most crippled company out of the deepest hole, because advertising is the parent of printing, and printing is the pilot of prosperity.

I thank you, Gentlemen. (Long continued applause.)

TOASTMASTER DENNING: Somewhere about the geographical center of the United States is a very thriving commonwealth with some four or five or six million children, and every child born in that commonwealth has a very good chance of being the President of the United States. Every male citizen of voting age within the confines of that commonwealth believes that some time he is going to be president of the United States. Of course

there are a few of them — in fact, more or less of them — disappointed at times; but talk to a citizen of that state, and after awhile you may get the idea that he has a vague and dim impression that possibly there might be some place known as the United States outside of his commonwealth, but he is never particularly interested in it himself.

Now we have a resident of that state with us tonight, and those who attended the convention on the opening day heard him respond to the address of welcome from the City of Buffalo. Now he claims that I have taken a mean advantage of him. He notified me in advance that he was going to take some very bitter and personal reprisal upon me tonight for insisting upon him responding to one of the toasts. But I simply say that I do not care a darn whether the man is from Ohio or not, I am going to take a chance by introducing to you Mr. Freeman T. Eagleson, former speaker of the House of Representatives of the Commonwealth of Ohio, and known as the "Silver-tongued orator of the Scioto River". (Long continued applause.)

MR. FREEMAN T. EAGLESON then said:

Mr. Toastmaster, Gentlemen of the Convention:

I can stand for almost anything so long as they do not refer to me as the "silver-tongued orator of LaPlatte". (Laughter). I responded because of the graciousness of my nature as a minute man in greetings to the salutation from the City of Buffalo on yesterday, and then I settled down to enjoy the convention and to find out the truth of the suggestion made by him who welcomed us, that Niagara Falls wasn't far away. (More laughter.) I was not off of the platform very long, however, until, in company with my fellow members, I discovered that a good portion of Niagara Falls had been brought over to Buffalo. (More laughter and applause.)

I am here candidly under protest. I was told this afternoon about three o'clock by a very arbitrary, though cultured looking gentlemen, whom most of you know little about, fortunately for him (more laughter), that I was expected to fill in tonight a vacancy on the program. I take it that he intended me to be a sort of John the Baptist and to proclaim the coming of what the pro-

gram and announcements of this convention were, that there would be one great central address ,and I expect that will be true after the convention is over, and hence I unhappily bear a relationship to this czar, over second to my left, so that I could not very well afford to go to the mat with him, because I have decided to send in some expense accounts to him when I get home. (More laughter and applause.)

This is a wonderful banquet, Men. Sitting at this banquet table tonight and witnessing this program of pleasure and amusement and "suggestion" (great laughter), I recall the language of the great lyric, who said:

"We are living, we are dwelling,
In a great and awful time,
In an age on ages dwelling,
To be living is sublime",

and so I am going to be John the Baptist tonight and say to you that there comes after me one whose intellectual achivements, whose public recognition, whose ability to tell the great story of the relationship between government and business, with the charm of a love story, that will hold us here until the last word has echoed away, is one the latches of whose shoes I am unworthy to loose. That is my pleasure — I am going to insist on — I enjoy it much as I hate it. (Great laughter and applause.)

I have had the honor of sitting, next to my right, by the side of the greatest geologist in memory or in life, (great applause); a man who can turn back the folds of the secrets of the earth and tell you where to go to drill. To my left is the speaker of the evening.

I do come from Ohio. Thank God. (Laughter and aplanse.) The rainbow comes down in Ohio, and, being true to the traditions of Ohio, I could not do other than respond to this emergency call, even though the ambulance may come later on. (More laughter and applause.)

When I think of Ohio, I remember my history when Ethan Allen — and that was back in the days when men were really patriots and when they lived for principle and not for office — when he was down in the center of the Nation's Capitol, he was

was made the subject of ridicule, because of his great uncouth appearance, and one foppish gentleman asked Ethan Allen what they raised up in Vermont, and Ethan Allen straightened up some six feet in height and looked him in the eye and said "We raise men". Now since the Toastmaster has moved from Ohio over to Pittsburg I say we still have men out in Ohio. (Great laughter and applause.)

I come to this banquet unadorned as a banqueter, and unprepared. (More laughter and applause.) But I remember old Bobby Burns, that wonderful bard, the night he met with royalty and they would not let him sit at the banquet table because he had on a garb like this (indicating), and he was driven out to the kitchen where the servants were working, and he sat down and he pulled an old envelope out of his pocket and wrote that wonderful poem, each stanza of which winds up "And a man's a man for a' that"; and so a man, though not in banquet garb, may be "a man for a' that". (Renewed applause.)

There never was a period since the Mayflower touched Plymouth Rock that this country needed a man as she needs this man tonight. There has not been a day since Paul Revere made his memorable ride to warn the colonists against the onslaught of armed enemies, that there is such a need of Paul Reveres as tonight to tell the people of this country that the enemies of the government that he has helped to found are making assaults upon the citadels of every sacred institution under the flag. (Great applause.)

This audience is equivalent to ten thousand of the ordinary audiences. You are here from the Southwest. You root for the Texas League when you are at home. You are here from the west. You are here from every gas producing state in the country to represent America. My suggestion and my appeal to you tonight would be to remember that our duty tomorrow is to make over the government of this country and to save for the children that are to follow the institutions which were given us by Washington, saved by Lincoln and handed over to us for our sacred keeping. This banquet would miss its purpose if we did not have before us in this hour the solemn obligation of American citizenship. You have read the story — you know the history —

you have been told that the hand of God was controlling the hands that fashioned this country in its early days, and you have read the story with increasing charm of the settlement of our fathers on the bleak, rockbound coast of New England. Did you ever wonder why — and it would have been so easy, for some friendly current to have carried that Pilgrim Bark to the south and landed them on the coast of Florida, where they could have basked in the sunshine, lived on the spontaneous products of the earth and passed a peaceful happy existence, thus avoiding the encountering of unfriendly forests and the murderous Indians and a rugged climate.

What was the purpose of that? It was this: God does not build nations out of that character of mankind and he sent the Mayflower to New England in order that there might come out of New England the granite of a Webster, to build a constitution in defiance of a king, that would give to this country of ours, America, the child of the earth's old age, an ideal institution under which men might have civil and religious liberty (more applause). So I say to you tonight, my fellow citizens, — my four minutes are up — as public utility men, we who have to deal with the public must adopt all that has been said by the speaker who preceded me. We must not only go to the public with business and economic questions, but we must become the advocates of good government and honor among men. If the institutions of the United States of America are to be torn down by the Bolshevikic element, where is the government and the world that can hold up to civilization an ideal? There is none.

This government was founded by the noblest impulses ever given to man. Separated by three thousand miles from the corruption of politics in oriental courts, free from demagogery and monarchical forms of government, out forefathers wrote into the constitution a representative government far enough from a despotism to be free from tyranny. On the contrary, with the story of Greece with her absolute democracy and at the same time the worst despotism and rottenness of government in the world's history, they were careful to avoid an absolute democracy; and yet, in these later years, there have come among us people who are striking at the very foundations of this govern-

ment, insuring to us as was intended by our forefathers, civil and religious liberty, and that includes it all — civil and religious liberty.

I must close. I want to say to you that the story that is coming to us next is the story of "The Relationship of Government to Business", but, personally speaking, I wish to be quoted as saying that we should have less government in this country and more uninterrupted business. (Great applause.)

So I say to you, Gentlemen of the Convention, let us go back to the vocations that have been given us in the natural calling of our lives, with a higher resolve and a nobler purpose, to not only be business men in an economic sense in our respective communities, but to be leaders in those communities to teach the rising rising generation the obligation of citizenship. Too many of us — all too many of us, would consider that government is a thing apart from business. A business man has no time for government, that the government is for the politician. A politician, in its truest sense and when properly defined, is a good citizen, and the man that becomes too much engaged in business or too self-conscious of money or wealth or social position, or any condition whatsoever, that he becomes so forgetful of the institutions that have made it possible for him to live, is a damagogue, and he is untrue to the country that gives him the opportunity so to live.

Therefore I say to you, my fellow men, let us go from this convention to our homes with a new inspiration. We have had a wonderful convention and we have been wonderfully received by the City of Buffalo; we have had wonderful exhibits at the convention hall. And do you know, as I went through those exhibits I could not help but think of the statement that the immortal McKinley made out here at the Exposition Park — back yonder just a few blocks away — because he stood for the institutions to which I am referring — when he said "Expositions are the time keepers of progress", and as I wandered through those exhibits today there came echoing back through the halls of memory that statement of William McKinley, and I said to myself "Here are the evidences of the progress of this great industry". It was good to be there. (Great applause.)

Now, Gentlemen of the Convention, I was told this afternoon that I survived the first attack yesterday and they were going to send me back in the hope that I would get a knockout on this round (more laughter). I wish when you return to your homes, whether it be to Texas, to Oklahoma to Pennsylvania, to West Virginia, or where not, that you will find, upon returning to your hearthstones, that all will have been well and there will have been no sadness, no sickness, no death, no sorrow, that may have entered those homes since you left there, that would cause regret when you go back to those whom you love. I thank you. (Great applause.)

TOASTMASTER DENNING: Fellow men, don't you think honestly he pleaded guilty to the indictment? Didn't he prove to you that he was the silver tongued orator from the Scioto? Didn't he admit that he was from Ohio?

I picked up a paper the other day and saw this little story. A man took his young son into the gallery of theHouse of Representatives at Washington just about opening time and the Chaplain of the House arose and gave a prayer. The little chap said to his father, "What was that man praying for these men for?" The father said, "My son, you are wrong, he tock one look at those men in the House and then he prayed for the country". (Laughter.)

Now you observe that incident occurred in the House and not in the Senate. I am not sure that the country needs praying for on account of the Senate, or that the Senate needs praying for on account of the country. Possibly, however, it were well at this particular time, to leave that as a debatable and mooted question, leaving it possibly for posterity to decide that issue.

Mr. Eagleson has so very aptly and forcibly said there never was a time in our country's history wherein the cool, calm judgment of business men, men trained to big affairs, men trained to keen thinking, to honest thinking, to right thinking, men with courage to do the right, as God gives them the light to see the right, than is needed now. Possibly at no time in our country's history, with the possible exception of the dark days that immediately followed the Revolutionary War, has there been or will there be more men of such calibre needed than are needed now,

or will be needed in the next ten years. We need such men and we need them now, and to the pride of our country, to the glory of our institutions, Thank God there are such men.

I believe we have one of them with us tonight and it is my very great pleasure — my very great honor, to introduce to you at this time the former Governor and now the United States Senator from the State of New Jersey, Honorable Walter E. Edge, who will speal to you upon the subject, "The Relation of Government to Business".

Gentlemen of the Convention, I now present to you Senator Edge.

(Applause, the banqueters rising to their feet in tribute to the next speaker.)

HONORABLE WALTER E. EDGE, ex-Governor and United States Senator from New Jersey, then said:

Mr. Chairman, Fellow Americans:

I wish I could trade uniforms with the silver-tongued orator to my right. (Laughter). I am sure I would feel very much more comfortable, but I have gotten the habit. So here I am.

I am not entirely positive that the Toastmaster in his pleasant introductory remarks was correct — perhaps he wanted to be considerate and I appreciate that — but, was correct in his assumption that we did not need prayers in the Senate. I am inclined to differ from him, but there is a community of interest that comes to me particularly in attending this convention and remembering what it represents. I think I belong to the greatest gas producing body of men that has ever been brought together in the history of our country. (Great laughter.) And I might emphasize that by saying it is natural gas too. (Renewed laughter.) And I am perfectly free to admit, in my short experience as a member of the Senate — one year today — that at times I feared that I would become inoculated with that germ of deliberation which seems to pervade the atmosphere of the Senate Chamber, and I must admit that I have been fighting against it (Continued laughter and applause).

I do not, however, want to leave the impression even in semi-humor that my colleagues waste all of their time or that

they are not patriotic, or that they are not giving grave and determined study to the unusual problems which are facing us today. They are. But I do contend that they waste a great deal of time in doing it, and in reaching conclusions, even though the problems are difficult to solve, and if the average business of this country was conducted with a similar policy there would not be very many successful organizations in our great country, and I say that with all kindness.

During the times of war the people owed their first allegiance and their energy to the government and in times of peace their government owes everything it can give to the people. A year and a half has elapsed since the Armistice was signed, and yet the public today are still unfortunately to a great extent in the dark as to the policy that the government should provide to regulate our future activities. A year and a half ago we had contributed so much to the successful outcome of the war and our armies returned from the other side and our troops were rapidly demobilized and the men sent back to their home environments, and at that time the entire world was practically at our feet. We had the admiration of every country allied with us in the great contest and we had their sincere thanks and appreciation for the contribution we had made. We had the positive respect of our enemies, and yet we have been floundering about for a year and a half; successful in time of war and absolutely unsuccessful to determine a definite policy for the reconstruction times of peace, and today we all appreciate that we are facing conditions that are trying every one of us. We look to Congress naturally for some relief. We at least look to Congress for leadership and we look to our government for leadership. The inherent responsibility for government — if it has any responsibility, and it has — is self-protection, and yet during this year and a half, as a part of that government, I must frankly admit that the inspiration from the Capitol has been of a very doubtful character. Today the problems that are facing us try men's souls. Every day it seems something new comes up for solution, and we cannot see the end.

Now I know I am proceeding in rather a pessimistic mood. I am going to get away from that as I proceed, but I think it is only fair — and we must meet conditions as they are existing —

to recognize the conditions that we are confronted with. When I read in the newspapers and hear on the public stump the criticisms of the high cost of living, which of course first comes directly to the daily life of all of us, and then we go back and recognize that we are in an era that seems to be controlled first by the continuous demands to shorten the hours of labor and to raise salaries necessarily, and produce, naturally, because of these two things, less in the way of production, you cannot get the answer from Congress to reduce the cost of living. It is utterly impossible to reduce the cost of living or the cost of commodities when we are accepting these three conditions today as we are throughout the land.

But Congress can do certain things. Congress, in my judgment, and the country through Congress, is now reaping the results of this failure to stand up, dating back first to the passage of the Adamson Law some seven years ago, and, following that, one happening after another, until today, absolute fairness to all classes of citizenship, be they employer or employee, it is made obvious that there is a lack of leadership, a lack of control, which means necessarily a lack of inspiration, and with the result that the conditions are as we all know them to be. There must be leaders in a great country like ours. There must be men whose leadership is recognized and those men must realize the great position they occupy in public responsibility, and if we are going to again go forward in those progressive steps and leaps and bounds of the years leading up to a few years before the war, that leadership must be respected by all classes of citizenship, and because of political expediency we cannot yield to unfair popular clamoring demand. My conception of the relationship between public responsibility and active business I hope is not beyond a commonsense accomplishment.

In a modest way, as Governor of the great State of New Jersey during the war days and a few months before we actually entered the war, we tried to see if it were not possible to develop a new view-point. We realized that the millenium had not arrived, and probably never will, but at the same time a new View-point representing the responsibility of government to the

people and to the state and, in my judgment, the same relationship only in a very much more important detail, can be carried out in the relationship of the government to the country and to the people. We tried to enlist that government, not alone in carrying out a political program. Let me say, however, I believe thoroughly in political organization, but I believe in it as a means to the end to accomplish real service, but we tried to develop out of government, with all its great power — the government of a state and, in greater comparison, the government of a nation is unlimited in its opportunity to really cooperate with the great business interests of the country. It is limited only by the constitution, and that is a very liberal document. So in New Jersey we mobolized our forces with the idea of bringing into active development those resources that the state provided. We felt that the Legislature was wasting its time merely to pass laws for the moment that seemed to have some popular sound, but we realized we were a state almost entirely surrounded by water, situated between the two great Commonwealths of New York and Pennsylvania, and between the two great metropoli of New York City on the one side and Philadelphia on the other, and that we had not had perhaps the entire comity of interest as between those states as was possible.

So we mobolized our political forces and our public forces and enlisted our public men in a campaign to harness up those states for the accomplishment of some general achievements which would inure to the welfare of all. It needed leadership. It needed political leadership. It needed the men who had been given public responsibility. It was to extend beyond the ordinary opportunity of private capital. So now we are preparing, as you well know, to build a vehicular tunnel under the Hudson River to connect New Jersey with New York and relieve the great traffic congestion that has existed there for years. They had talked about it almost for 30 or 40 years since tunnels were known as practical, but nothing had been done until the State of New Jersey took hold of the problem and sought its solution and we were met with instant response from the authorities of New York.

In the same way we have actually started the construction and have the details ready to build a bridge over the Delaware River in order to harness the great City of Philadelphia and the great State of Pennsylvania with the State of New Jersey, and the two projects taken together have very greatly enlarged the highway system, until now we have concrete highways running into practically every corner of the state, and in this way we feel that we have put the State of New Jersey on the map, as it were, and prepared to give advantage to the citizens of all classes, for it radiates to every class of citizenship and adds to the prosperity of each and all.

This has been accomplished by public leadership and by the use of the great opportunities of office and of organization in a movement of that character.

And so along the same lines the Government of the United States, if we could reach a time when the President of the country recognized that his job was at the head of a great big business, to -wit, the business of government, the greatest and most powerful business in the land, and, in addition to that, his constitutional obligations, which we all recognize — he would be a leader and an inspiration, with his Cabinet and his Congress, representing every corner of the country, to meet business obligations and to encourage and to inspire the doing of those things necessary to avail us all of the great opportunities that this country affords.

So a year and a half ago the whole world was practically waiting for America to take advantage of the great opportunities brought on by the war. We built a merchant marine. We have some two thousand ships today, running into millions and millions of tonnage; and yet, with our men in public life talking about extreme nationalism, what are we going to do with those ships? Are we going to send them abroad in ballast or are we going to send them abroad filled with the products of the farm and the factory to the ports of the world? Those opportunities are simply awaiting a business Congress and a business President and a business organization in Washington to take advantage of. (Long continued applause.)

It is almost criminal, when we recognize and realize how the country — the world, rather, is waiting for American inspiration. (More applause.)

To come back to our own domestic troubles and realize that all over our land we are fighting little internal difficulties, irritating difficulties, we must realize that we are not taking hold of these wonderful opportunities that now present themselves to us. During the war, — I do not care where you come from — you are all a part of the same country — during the war, after years of individual progressive development, we suddenly recognized we were meeting a crisis and the real American spirit came to the front. We organized all over this country, in towns and in villages and in cities, and every request or suggestion from the government to fight the war, either here or abroad — and we had to fight it in both places — was met and anticipated by the citizenship of this great country. Men and women alike organized. Class distinction and social distinction were obliterated and a new sentiment was brought out. The real American citizenship that we like to talk about and seldom practice was brought to the fore, with the result which we of course all know. It was the most wonderful response to duty that has ever been or ever will probably be recorded in history, was the answer of the American men and women, and if we could only retain some of the same spirit now when we are meeting these problems of reconstruction and with these grand opportunities, wonderful as they are, from every corner of the land, presenting themselves to us, we cannot help but prosper.

I know it is not particularly interesting, in a way, directly to gas men whose product necessarily must be confined to comparatively a local district, but it is interesting too because you are a part of the citizenship of this great country, and the country must prosper in all its branches and all its activities in order that you prosper or any other particular class of citizens engaged in a particular avocation may prosper, but we must consider today, with our increasing population and demands, that we cannot prosper in this country continuously and go ahead in the way we have learned that it was possible to go ahead in the days of the past, unless we do do business with the world. We cannot con-

sume all our products, if we get anywhere near maximum production, which we must arrive at if we are ever to have renewed prosperity, and we must prepare for a business practically with all the world.

I have been very much encouraged in Washington in the last few weeks that we have finally passed — I had the pleasure and honor of being a member of the select committee appointed for the purpose of preparing a budget bill. I know it is a dry subject and I am going to pass over it very rapidly, but it has very much more importance than the word "budget" would signify simply by mentioning it in passing; a budget bill which provides that the finances of your government hereafter will be conducted, I hope, sometwhat upon the lines of every real successful business. You complain of your taxation, and it is very natural that you do, and yet you misunderstand that the government does not make money; the government spends money; when it tries to make money, as well evidenced by our experiment in railroad management, we lost money, with the result that the only way in the world we can ever reduce taxation is by cutting down the expenses at Washington. We cannot reduce them in any other manner.

Yet a year and a half after the war we were asking for appropriations totalling over 5½ billions of dollars. Just think of it! A few years before the war Congress was criticized all over the country because it was known as a "Billion-dollar Congress", and yet a year after the war, with the armies demobolized and supposed to be getting back and returning to fairly normal conditions, we are asking for 5½ billions of dollars from the taxpayers of the country to run the government. We did succeed in cutting it down by a billion and a half, but even at that the balance is entirely too much. There is absolutely no reasonable excuse for the expenditure of that much money in ordinary governmental activities; but we never could systematically or scientifically meet those payments under the old system. With the budget system, where a careful investigation and examination of the money requested is made before the estimates are finally passed on to Congress, I hope and believe that we will be able to

greatly reduce the appropriations, and of course in the same ratio reduce the taxes levied upon the people.

Why, just as an example — and I think it will be interesting to you — in a cursory examination of a governmental activity, in leading up to this budget which we have been talking about for twenty years, we found 47 different boards, bureaus and commissions, separated by three or four different cabinet portfolios, sharing the responsibility of the Department of Public Health, a very important responsibility, of course, but to think that there are 47 separate boards, absolutely unrelated to each other, overlapping in their functions and in their activities and their responsibilities, in every way cognate; no relationship to each other, and we found, in just a short examination — we did not need much of an investigation, but in the short investigation we made, we found that in one of the most important departments at Washington, the heads of the various bureaus, boards and commissions were avoiding responsibility and passing the buck to the other fellow.

But by the installation of the budget it will be possible naturally to improve that situation in a very marked degree. One reason for a budget — just as it is practiced in private business — is to do away with duplication; to bring the business all into one great big organization, with the president at the head of it, and his various cabinet ministers directly helping him in their various cabinet responsibilities, and I think from that in time we will form a business government down there that not only will save millions of dollars, that not only will make efficiency most important, but that it will establish the one thing that I have been generously discussing, which is the fundamental thought back of it all, and that is that the government in this way becomes a real big business organization, and with the political side of government, necessary as it is, to establish certain lines of demarcation and certain lines of contest and certain avenues and channels in which to promulgate ideas, finally when a man gets to Washington and puts up his hand and takes an oath and assumes the responsibility of office, he will recognize that he is a director in this great big business of America, and through that business they are going to back up every line of industry in the country so that we can compete in every activity, in every country in the

world, as we competed when we refound ourselves in the war with all of the armies of Europe. So I look forward, and I do not think I am over optomistic or hopeful about it, but I look forward, with the help and co-operation of all interests, of all business men and of all classes in the country, to a new era of public responsibility in its direct relationship to business I look forward to that thing you have never known of in your ordinary contact with public affairs, outside perhaps of your own village or town, where there must be naturally a community of spirit — that one thing that really is co-operation rather than over-regulation. I believe this great government will gradually — even though we do see signs continually the other way — will gradually take on and absorb responsibility from that standpoint and from that point of view. (Applause.)

The speaker to my right very eloquently referred, — and I want to say, Mr. Eagleson, that I am very fond of Ohio too — I am not here to talk politics, but your mentioning Ohio and mentioning that it is a State of Presidents, or at least of presidential aspirations, leads me to say that I have a warm friend in Ohio, a fellow member in the United States Senate, a man whom I greatly admire, and admired even long before I went to the Senate, and while I am a delegate — so I should qualify all my remarks for I am made a delegate at large to the Republican National Convention and am pledged to vote at that convention — and which I will do — just as long as there is a possible chance for his election, for General Leonard Wood (Applause) for President on the Republican ticket, running as I have under a preferential primary, and those are the instructions that my State has given me — yet at the same time I want to say very frankly and without hesitation that I believe that the ideals that I have hastily and generously touched upon as the ideals of governmental responsibilities, as I have conceived them and view them, in my judgment, would be well administered if, in the final consideration of that great convention, soon to meet, if the presidential nomination, and, later, the selection of the people should fall upon your distinguished fellow-citizen, the Honorable Warren G. Harding of Ohio. (Long continued applause.)

But I am not here to talk men. I believe that whoever we elect — because I do not believe the American people will elect, with the knowledge that they have of the responsibilities of today and what we are facing, any man who does not come near to representing these broad general view-points — and whoever is elected President of the United States, if he is going to meet what I believe to be the popular demand, even though it has not been perhaps emphatically brought out, he must recognize the absolute ascendancy of real common-sense business government rather than extreme idealism.

I started to say the speaker on the right referred generally to the possibility of the country having difficulty to meet the situation that has been brought about in recent years because of the apparent invasion, or discovery here at least, in our midst of a certain Bolshevikic element of residents — seldom citizens; I recognize, as we certainly all recognize, that this great country has only become great because we have given every opportunity to those who come to our country under modest restrictions and surveillance — too modest, I am afraid, at times — and who become law-abiding citizens of the country and through the combination of citizenship representing practically every clime and every race, we have gradually developed what we are proud to term a composite American citizenship. Certainly there is not a man in this auditorium who can go back many generations without recognizing the fact that his ancestor came from some one of the old countries.

I have no desire to change that policy as developing American citizenship, but I am even inclined to believe right now — although my view is not acquiesced in, I know, by many, but I cannot help that — I am rather inclined to believe now that we should, to an extent — because of certain labor conditions in this country — let down the bars a bit on the subject of immigration, never, however, letting the bars down to the extent that we permit the entry of that class of citizens whose political or social record abroad would seem to make them "undesirables". But I am less interested in what is known as the literacy test in these days than I am in seeing to it that that type of men who may have had the benefit of considerable education on the other side,

and who are using it to a wrong advantage are not permitted to enter.

In other words, I would rather see the men admitted to American today who perhaps could not meet the so-called literary test if his record at home was such as he was known to be, on proper examination, not an undesirable — (and we should examine them over there instead of here at Ellis Island — I have always said that) — so as to demonstrate that he had been a hard working citizen of his country, than to see the more educated and at the same time more dangerous alien admitted, although he could pass the literacy test.

I am particularly interested in raising the so-called literacy test. We must admit that through this war our young men have taken a new standard and we must approve of it. They have had contact with a broadening process as they have returned from the other side, and from that contact even in the home camps they have had a little more forward viewpoint as to the place that they should fill in society, and we must and do approve of that ambition, and with the result, that in my judgment — and I believe the figures are substantially correct that have been published frequently of late — we really need in this country today, to help solve the great problem of production, a few million hardy sons of the other countries of the world who have not perhaps reached that same standard in life as they, and who are ready to take the pick and the axe and the shovel and help develop the still undeveloped possibilities of our great land. (More applause.)

But with all that, believing thoroughly in free speech, believing thoroughly in those tenets which have made the country great, I am absolutely out of sympathy with those who have had control of conditions in our country and who have pussy-footed with the situation during the last ten or fifteen months and who have not deported hundreds of agitators who should have been sent from the land the moment they raised their hand or their voice in defiance of the Constitution of the United States. (Continued applause.) The distinction is perfectly clear and there is absolutely no extenuation that can be made for any hesitation in deporting such undesirables. I do not care what the party name

may be or what the society name may be; any man or woman who enjoys the liberaties and opportunities of this country, let him speak, but the moment that he, through voice or pen, attacks fundamentally the constitution of this country — it is not necessary for him to resort to violence, but when he even counsels or suggests violence or attack, they should deport that man and look up the law afterwards. (More applause.)

Now, Mr. Chairman, I realize that this drift of discussion is pretty dry — rather serious, but these are serious times, and I have been — and I am sure you have all been very much disappointed with the apparent failure of our country to respond to its opportunities. I have been trying to help find a solution, as a man charged with some responsibility, and I know my colleagues have. I have almost determined, with the exception of the certain policies which I have generally referred to at the outset that Congress can lay down, that the main solution of our industrial problems today lies with the employer and the employee. I hope it is not going to be necessary for us to go through more trying times before we recognize the situation we are leading up to. The American people have a temperament which we admire but yet which is very expensive to us in many ways. They so easily forget the inconveniences and the troubles of yesterday, and we have been patching up these different difficulties as they have arisen day after day during the past year particularly, but after they have been temporarily adjusted — some expedient brought in to straighten out the situation, then we have gone on, like the man that signed the ninety day note and said "Thank the Lord, that bill is paid".

We had a strike a few weeks ago that is not entirely over now, known as the Outlaw Strike, and in my particular section of the country we are very hard hit. Hundreds of thousands of commuters who lived in Northern New Jersey and whose business was in New York City were kept from going regularly to their business for several days, many of them failing to reach the metropolis at all. I was in Washington at the time and I received numerous telegrams from the mayors and civic societies complaining of the situation, very naturally. I called up the Attorney General and asked him what he proposed to do about it. I

got him at his house before he had left. I cannot criticise that because I was also at my house, for it was early in the morning, and I said "Have you law enough to handle this situation, or do you need more law? If you do I am prepared to go to any limit. It seems to me this situation, however, can be met and should be met." He says "I think we have law enough; of course, as understand, the law requires that we legally discover a conspiracy; locate what is known in law as a conspiracy, and we have hundreds of agents in the Department of Justice, and I think in a few hours we will be able to locate a conspiracy". Well, I do not criticise. I think he was earnest and conscientious in trying to carry out the law as he interpreted it, which was probably undoubtedly correct, but it made me think a little, and I went over to the Capitol that morning and called one of the assistants in the Department of Bill drafting to my office and asked him if he did not think he could draw a law, or an amendment to the existing law, that made it a misdemeanor for any body of men to leave their employment when such employment dealt directly with health and the very life of innocent citizens of the country, when they had not stated a grievance, and when they had not registered a demand for any change in conditions, but would make it a misdemeanor under such conditions, without asking to send three or four hundred sleuths around to find out if a conspiracy existed, when hundreds of thousands of innocent people were kept from their daily work and daily employment because of such conditions. The result was that we drew such an amendment and I introduced it. It is now in committee, and, as an encouraging note, simultaneously practically there were two other bills introduced by two other Senators from other sections of the country along similar lines. Those bills, I believe, will be combined into a law and it will be reported favorably, and I sincely hope that the Congress of the United States will act accordingly, with all due regard to the rights of every class of citizens, for I do not deny the right of any man to quit his employment if he sees fit to do so, but I do deny the right of any body of men to quit their employment when dealing directly with the public health and welfare without having stated a griev-

ance or demand before they lay down their tools and walk out of their shops. (More applause.)

I believe also, and a very encouraging note for the future is apparently evidenced in Congress today, in doing away with class distinctions. This great country cannot exist when we have one law for one class and another law for another class. I have every confidence in the broad viewpoint of the leaders of labor and every reason to recognize the absolute justice of taking into careful consideration all their requests and demands for better working conditions and salaries, but I do say that it is simply breeding a discontent that has been increasing since the days I have spoken of before, to-wit: the day of the passage of the Adamson Law, to have outside of the jurisdiction of any law — any controlling law, any class of citizens, be they farmers organizations or be they labor unions, and today, if we are going ahead, enlisted together to take advantage of these great opportunities, we cannot do it unless all classes of citizens are subscribing to the same regulations and the same control as every other class of citizens. (More applause.)

And so today there is a bill before Congress to do away with these exemptions; and in the first test vote we find an encouraging sign for the future. Let me say today that a very large percentage — I know it from contact in my own state — a very large percentage of these men — so-called laboring men and farmer's organizations — have no thought or desire for such an exemption, are asking for no special consideration or favors, and, as an encouraging note, in Congress only a few weeks ago, in the Senate on the first test vote doing away with these exemptions, we were beaten by just three votes, the vote being 28 to 31. It will come up again and I believe it will be adopted by the Senate. That simply goes to demonstrate, and I hope it is an encouraging note to you all — that we are recognizing and trying to correct some of the errors of the past when we have been following too much the lines of political expediency.

This country, with its great opportunities, cannot prosper and cannot go ahead the way it is destined to do and the way it should go unless we do pass such laws that relate alike to every class of citizenship. (Applause.)

And may I say in conclusion, that I am very glad to have had the opportunity of meeting you men who represent — I do not say it flatteringly at all, but I say it very earnestly, because I am not given to much flattery — you men who represent that type of American citizenship that you do represent and who understand your responsibilities and your duties, who are in constant contact with your fellow citizens in very busy part of this great land, may I suggest to you that you have a great responsibility to perform with your public men, the men you send to the Senate and to the Governor's chair. While they have an opportunity and a great power and honor — but the honor soon wears out — for this sentiment is molded and created through the contact of man to man throughout this country, and it is the upbuilding of this sentiment that is going to solve these problems in our industrial world. It is the same contact that we brought about during the war; the same understanding that we developed when the problem was all one problem and we all subscribed to it. The problem today, even more important in some details, is the same one problem. It is the problem of really reaching a state of mind, as it were, where men can negotiate; where men will recognize that unless they do work, unless they do develop, with the renewed energy that they had in the days gone by, we are going to reach a calamitous period when men and women will suffer and suffer greatly. We cannot solve these problems, may I say again, in Congress; we can only help along certain lines; you can solve them; your associates can solve them; your employers can solve them; the men who work can solve them, by recognizing that the one fundamental principle of success is work and production, and today this great country with its great opportunities has distinctly laid down on the job.

For the good of posterity, for our own happiness, may we soon get out of this "Fool's Paradise;" may we recognize the rights of both sides justly and fairly; may we organize with the same spirit in industrial life that you did in the dark days of war and solve the problem as real Americans. As that army of four million boys solved the big problems of the world war. do

not let it be said that we' who have it in our own hands, cannot solve the problems of industrial peace.

I thank you. (Long continued applause).

TOASTMATSTER DENNING: Just one minute, Senator; I am sure that every one present here tonight will leave this hall with a better idea of our rights, our duties, our obligations and our responsibilities as American citizens from the enlightening and admirable talk which you have given us, and on behalf of the Natural Gas Association of America, I desire to thank you very much, inded, for your presence here and for the splendid address you have given us. (Great applause).

Gentlemen, we will now stand adjourned.

THIRD DAY — MORNING SESSION.

THURSDAY, May 20, 1920

PRESIDENT OLIPHANT: Gentlemen, you will please come to order. The first order of business on our regular program this morning is the report of the Committee on Awards for the Wrinkle Department, of which Mr. F. W. Stone, of Ashtabula, Ohio, is chairman.

MR. F. W. STONE, as Chairman, then submitted the following:

REPORT OF THE COMMITTEE ON AWARDS FOR WRINKLE DEPARTMENT

To the President and Members of The Natural Gas Association of America.

GENTLEMEN:

The number of wrinkles submitted this year has been so great and of such a varied and valuable character that your committee has not had time to give them the consideration they should have if the prizes are to be awarded to those who are entitled to them.

For this reason the committee asks that they be give further time for consideration and be allowed to send their report to the Secretary at a later date.

Respectfully submitted,

F. W. Stone,
Chairman of Committee on Awards.

REPORT OF THE COMMITTEE OF AWARDS FOR WRINKLE DEPARTMENT

To the Secretary, Natural Gas Association of America.

Dear Sir:

We beg to herewith submit to you our findings in the matter of the awards of prizes for wrinkles submitted this year.

We trust that you will fully appreciate that the matter of awards has gotten to be quite a task, as the interest in the wrinkle department seems to be very great and the number and kind of wrinkles are so great and varied that the making of awards of this kind can only be a matter of opinion on our part and we trust that those not receiving prizes will accept them in that light. Those to whom we have made awards we feel have added something new and of value to the industry, and trust that their small remuneration in this particular respect will be greatly enhanced by the knowledge of something accomplished.

The first prize — $25.00 — *Wrinkle No. 147 — "Gasoline Weathering Tank"* to *Henry Cooney,* The Ohio Fuel Supply Company, Sugar Grove, Ohio.

The second prize — $10.00 — *Wrinkle No. 107 — "Locating Hidden Curb Boxes"* to *J. H. Schalek,* Manufacturers' Light and Heat Company, Pittsburgh, Pa.

The second prize — $10.00 — *Wrinkle No. 123 — "Ventilation to Carry Off Heavier-Than-Air Vapors — A Safety Device"* to *C. H. M. Burnham,* The Ohio Fuel Supply Company, Columbus, Ohio.

The second prize — $10.00 — *Wrinkle No. 130* — *"Device For Taking Record of Amount of Gas Passing from Well to Line"* to *Ira L. Neely,* The Medina Gas and Fuel Company, Wooster, Ohio.

The second prize — $10.00 — *Wrinkle No. 96* — *"A Preventative for Wells Salting Up"* to *John Denslinger,* United Natural Gas Company, Shippensville, Penna.

The second prize — $10.00 — *Wrinkle No. 103* — *"A Blending Chart"* to *R. P. Anderson,* United Natural Gas Company, Oil City, Penna.

The third prize — $5.00 — *Wrinkle No. 163* — *"Well Drip or Condenser for Casing Head Gas Well"* to *C. C. Lynn,* United Natural Gas Company, Shippensville, Penna.

The third prize — $5.00 — *Wrinkle No. 108* — *"Condensed Table for Computing First Production of Gas Well"* to *Wm. Taylor,* Manufacturers' Light and Heat Company, Pittsburgh, Penna.

The third prize — $5.00 — *Wrinkle No. 57* — *"Curb Box Covers for Locating Ends of Mains and Service Stubs"* to *M. J. Young,* East Ohio Gas Company, Youngstown, Ohio.

The third prize — $5.00 — *Wrinkle No. 150* — *"Equalization System of Checking"* to *F. W. Phillips,* The Ohio Fuel Supply Company, Columbus, Ohio.

The third prize — $5.00 — *Wrinkle No. 48* — *"A New Angle to An Old Question"* to *J. H. Schalek,* Manufacturers' Light and Heat Company, Pittsburgh, Penna.

In view of the fact that it is very hard to judge the value of a device intended for the production end of the business as compared with one intended for the office end, we desire to recommend that next year a first prize of $25.00, a second prize of $10.00 and a third prize of $5.00 be assigned for devices for use in connection with each of the following departments: First, the *Production*; second, *Transmissions and Gasoline*; third, *Distribution*; fourth, *Office or Accounting,* and in case there would not

be sufficient valuable wrinkles offered to apply to any one department to take up the prizes offered the Committee to have the privilege of using their own judgment in awarding these prizes as they see fit.

Respectfully submitted,

F. W. Stone, *Chairman,*
John B. Corrin,
F. H. Crawford,
Wm. B. Way,
Committee on Awards for Wrinkle Department.

President Oliphant: Gentlemen, Mr. Stone asks for further time before the awards are decided upon by the Committee and if there is no objection the Committee on Awards for the Wrinkle Department will be granted further time as requested and the report as finally made may then be embodied in our proceedings by the Secretary.

The next order of business is a paper on the subject of Radiant Heat by J. P. Conroy.

Mr. Conroy: I think it is far more interesting to demonstrate what I am trying to show and therefore with your permission I will present this subject to you by way of demonstration, illustrative of the main features as contained in the paper.

Mr. Conroy then proceeded to demonstrate the main features of his paper and at the conclusion was heartily applauded.

RADIANT HEAT

By J. P. Conroy

There are three ways of transmitting heat thru space, namely by CONVECTION, by CONDUCTION and by RADIATION.

CONVECTED HEAT is when you heat up air or water it immediately expands rising directly upward while the cold gravitates to the bottom, such as in commonplace hot air furnaces, or any circulating water heater. It must be borne in mind the natural course of CONVECTED HEAT is always upward, and it will continue upward unless checked by walls and closed rooms until the hot air has cooled itself equal to the atmosphere. It is very readily understood and demonstrated in the case of a hot air balloon.

CONDUCTED HEAT is when you put a poker or rod of iron in a fire and a certain portion of the heat will conduct along thru the metal until finally the outer end of the rod will get hot. This heat follows along the metal in no matter what direction it lies, whether upward, downward, or horizontal. In a heating unit of any kind whether it be a stove, furnace or other forms of heating units for homes, factories or elsewhere, it must be borne in mind that CONVECTED HEAT and CONDUCTED HEAT play a certain part in all heating appliances, which must be reckoned with in the proper and efficient distribution of heat, and we want to keep those two methods of transmitting heat in mind in passing to the next and third way of transmitting heat — that is by RADIATION.

RADIANT HEAT is a heat energy that comes from almost any heated surface and leaves that heated surface at a direct right angle, going in the direction which it is started until it has spent its energy in space, or else until it has come in contact with some solid non-transparent body, and then the RADIANT HEAT will heat up such non-transparent body that it comes in contact with.

It has been supposed by many that RADIANT HEAT was given off only from a red hot surface, but such is not the case. Any heated surface will give off RADIANT HEAT, but its carrying power direct thru space is entirely in proportion to the intensity of the heated surface. For instance, a steam radiator will give off RADIANT HEAT, but the intensity is so low that this RADIANT ENERGY spends its rays in a few inches outward from the Radiator and then turns to CONVECTED HEAT, going upward. This can be readily observed by going into a very dark room where there is a heated Radiator, because one can detect the presence of the Radiator several inches away by the warmth that is felt on the hand.

Any warm substance gives off a very low intensity of RADIANT HEAT, but as the surface is gradually heated up then the intensity of RADIANT HEAT increases almost a ratio of four to one until the body is heated up to a red hot incandescence, when the intensity of RADIANT HEAT is very marked and will carry thru space in the way it is directed, for a very long distance. This is noticeable when one is in a Steel Mill or Iron Foundry where they pour off great masses of red hot metals. There is such an intensity of RADIANT HEAT coming right out direct from these metals that it is very noticeable fifty or one hundred feet away. It is also very perceptible from the open door of an intense furnace, or even from the open door of a Retort House in a Gas Works. RADIANT HEAT will leave this red hot mass, going directly on a horizontal line, will go thru cold air without necessarily warming it, and continue until it spends its energy in space.

RADIANT HEAT is almost identical to Light, and will carry thru drafts, thru glass or even transparent ice, just the same as LIGHT will do, the only difference being the RADIANT ENERGY waves are longer than the LIGHT WAVES, and more heat will be absorbed in passing thru a semi-transparent body or some transparent body like glass than there will of Light.

I have here with me a Radiantfire, on which I wish to give you a certain demonstration of RADIANT HEAT, that will convey to your mind the nature of transmission of RADIANT HEAT thru space far better than I possibly could do it in words.

Before going into this subject it might be well for me to dwell a few minutes on this Radiantfire and call your attention to the fact that we have here a series of ten burners, burning blue flames of about two feet per hour each, a total consumption of twenty feet per hour. All those flames are burned inside of those lace like Radiants, made of a composition which practically absorbs heat similar to the way a sponge will absorb water, and they glow red hot almost instantly. As soon as those Radiants become red hot, then they begin to give off RADIANT HEAT which leaves the surface of these radiants and goes right straight out into the room the way it is directed.

Now if I were to swing this Radiantfire to the right or to the left then I will be directing the heat in that direction. If I were to hold it backwards I would be directing the RADIANT HEAT upwards on a perpendicular line. Just imagine if you will, or rather forget for an instant that this Radiantfire is a Radiantfire at all, but imagine it is a search light. Now I am able to control this light and turn it in any direction desired by rotating this Radiantfire just the same as you might do with a search light.

I have here what is known as a Radiometer. This is an apparatus which was invented in Austria many years ago, and so far as I know it had no particular use. It has been used mostly, and all of you have no doubt observed it, as a novelty displayed in Jewelry or Optician's stores. When placed in a window on a bright sunshiny day these paddles would revolve around without any visible means of propelling them, and it has been supposed by a great many of them that this revolution was set up by light, but such is not the case.

As stated before the laws of RADIANT HEAT and LIGHT are almost exactly the same. A dark substance absorbs RADIANT HEAT the same as LIGHT, and the bright substance reflects RADIANT HEAT the same as LIGHT. Now you will note these four little paddles are mounted in this glass bulb, which is a vacuum, on to a very delicate pinion. The paddles are made of mica. One side is jet black and the other side is bright. So when this Radiometer is exposed to RADIANT HEAT the black side of the paddles tends to absorb and pull to-

wards the RADIANT HEAT, while the bright side tends to reflect and push away from the RADIANT HEAT, which results in setting up a motion here that causes the paddles to rotate, and the more intense the RADIANT HEAT the greater speed of the rotation.

You will note by holding this Radiometer to the side, above, or in back of the Radiantfire, especially above where there must be some heat rising, it has no effect on it, but just the minute you hold it directly in front of the Radiantfire it sets up a very lively motion, indicating a very great amount of RADIANT HEAT has been given off in this direction. Now, I have told you before that RADIANT HEAT will go thru space, and go right thru cold air without necessarily warming the air. It will also go right thru drafts, and drafts have no effect on it whatsoever. RADIANT HEAT will go right thru drafts or even against head winds without being reflected or even blown away any more than light rays.

It is rather difficult to describe in a simple way just how RADIANT HEAT travels thru space, but the best illustration that we are able to give you is it travels thru space similar to the way a wireless wave in Wireless Telegraphy; or RADIANT HEAT travels thru space just like the sound of my voice to your ears. It isn't a blast of hot air or current of heat coming out, it is just an energy which is transmitted thru the molecules of the air, and such energy cannot be disturbed by air currents or drafts in any way.

You will observe I have here an Electric Fan. Now I am going to start up this Electric Fan and blow a draft right straight across in front of this fire. Kindly note I expose this Radiometer to the Radiantfire on the other side of the drafts and it indicates RADIANT HEAT coming thru that draft, just as much as if there was no draft there. In order to further demonstrate to you I will shut this Electric Fan off a moment, and note that the speed of the Radiometer is as great while the fan is blowing a draft of air towards the fire and the air currents as it is without it, indicating that not one atom of RADIANT HEAT has been blown away or disturbed by this concentrated current of air. And at the same time if you wish to step up

here and place your hand on the other side of the fire and in the currents you will note it is fairly cool air which is passing in front of this very intense heat. Now then, I will place this Radiometer directly in the air currents where you can feel the intense draft on your hand, an intense draft is all about this glass bulb, and still it indicates very prominently here is RADIANT HEAT right in the centre of the draft.

Now, I have here what is known as a Radiant Pyrometer. This is practically a new instrument developed by Dr. Twinn of Philadelphia, and is used very largely in registering the intensity of a certain mass of molding metals in foundries, furnaces, etc. The principle of this Radiometer is by just aiming this barrel like tube at any surface at a certain distance it will register the intensity of the mass. Unfortunately the dial here is not a straight reading dial, but it must be a reckoned with factor whatever the dial reads is to be multiplied by 145. Now I am aiming this Radiant Pyrometer at the Radiantfire and it registers 1300. Now then, we will turn on the Electric Fan and again create a current of air between the Radiant Pyrometer and the fire, and kindly note that the Pyrometer is registering just as much RADIANT HEAT coming out at this point direct thru the draft as when there was no draft present. In order to show you the carrying power of RADIANT HEAT we will go out here into the room 15 or 20 feet, and in aiming this Radiant Pyrometer at the Radiantfire you will notice that it registers an energy of RADIANT HEAT to the amount of

In order that you might observe there is no trick or catch in this Demonstration I would like to have someone step between the nozzle of this Radiant Pyrometer and the fire. Note the moment a solid non-transparent body comes between the fire and the instrument the hand on dial will immediately fall back to zero, showing the RADIANT HEAT is cut off. Or, by turning the nozzle of this Radiant Pyrometer to this wall, the floor, the ceiling or any other direction in the room other than towards this red hot surface it indicates nothing, showing that this Radiantfire is giving off a RADIANT HEAT energy carrying many feet right straight out here into the room, just the same as if this

Radiant Pyrometer was a Photometer and the Radiantfire was a large Lamp instead of a heater.

But what is the object of all this Demonstration, and why should this RADIANT HEAT energy concern us, or in what way is it to an advantage to us over other forms of Heating? You may say there are only so many B. T. U's in a foot of gas and if it is consumed in this room it is liberated in this room, and you cannot get any more heat out of the gas. This is true to a very large extent, but let us imagine for a moment that instead of a Radiantfire here we have some other form of a gas heater which simply produces CONVECTED HEAT. Let us say we have a gas steam radiator, or let us say we have a gas log. Now all the heat generated from the consumption of this gas, if you could see exactly what happens, immediately rises right up to the ceiling beginning by banking the room with hot air and gradually filling up downward. Fifty or seventy-five per-cent. of all that heat just generated is lost by being chilled coming in contact with cold walls, cold ceilings, cold windows and escaping thru crevices. And, furthermore, it would take from a half of an hour to two hours to heat up a certain space, or rather heat up the air in a certain space, so that it would make the room comfortable on a cold day, while the same amount of gas consumed in a Radiantfire will give off a RADIANT HEAT energy which warms you almost instantly. It is possible and practical to go into a very cold room, say where the thermometer is registering zero, light up the Radiantfire, and in three minutes the Radiantfire will give off a RADIANT HEAT energy thrown right straight out in the room where you sit, bathing the body in RADIANT HEAT, and very shortly become quite comfortable in a very cold room. It is possible to go into a cold room, light up the Radiantfire, warm the body to a comfortable degree, and then turn out the Radiantfire passing out of the room without having raised the temperature of the room two degrees. It is not necessarily the amount of heat you actually generate which counts, but it is the distribution of the heat and how well it is distributed.

As a very marked demonstration of the difference between RADIANT HEAT and CONVECTED HEAT I will show you here a light with a solid non-transparent shade on it. Now there is as much difference between the distribution of RADIANT HEAT and CONVECTED HEAT in a room as there is between lighting a room by Indirect Lighting—not Semi-indirect. By Indirect we mean the non-transparent shade which throws all the light to the ceiling, then depending upon the ceiling to reflect the light back downward, and it is a well-known fact that by such a system at least three-fourths of all the light generated is lost in being absorbed by the ceilings and side walls. As an illustration, now I hold this light up towards the ceilings. Note the intensity of the illumination on the table and note the very marked difference and the very great increase in Candle Power on the table. Well, this is just the same and proportionately there is just as much difference in utilizing a Radiantfire where you direct all the RADIANT HEAT into the lower part of the rooms, where one sits, or where you utilize CONVECTED HEAT, sending all the heat up to the ceiling and depending on it to heat the room. There is even much more of an advantage in favor of RADIANT HEAT as against the Lighting, because by the Radiantfire you get the heat instantly while with the CONVECTED HEATER it takes quite sometime to heat up the air of the room so it is comfortable to the body in the lower part of the room.

Another great advantage of RADIANT HEAT over all other forms of heating, and largely the cause of this demonstration, is that of using fire in an open fireplace. Let us imagine for a moment we have here an open fireplace and we build a coal or wood fire therein. 80 or 90% of all the heat generated from the consumption of this coal goes directly out the chimney, and about all the heat that you get out in the room is the RADIANT HEAT coming out from the hot coals whose surface may be turned in this direction.

The United States Bureau of Standards at Washington in their circular No. 70, Page 215, entitled "Appliances For the Household" tells you this. Write and get one and read it for

yourself. They further tell you that there are 13,000 B. T. U's in a pound of Coal. Now when this coal is burned in an open fireplace, if only 20% of the heat is delivered into the room, you only get the benefit of 2,600 B. T. U's, while Natural Gas at 30c per thousand and 1,000 B. T. U's in a foot of gas will buy 16½ cubic feet of Natural Gas for ½c, or 16,500 B. T. U's in a Radiantfire will deliver right out in your room at least 80% of all the B. T. U's in the gas in the form of RADIANT HEAT. So from 80% of 16,500 you get 13,200 B. T. U's in RADIANT HEAT right out in the room where you sit as against Coal 2,600, or about five times more serviceable heat, and at the present price of Coal—worth about ½c per pound you can buy 16½ cubic feet of gas at the same price.

Imagine if you will instead of Coal in the fireplace some other form of a gas heater. If it were a gas log in the fireplace, which practically generates CONVECTED HEAT only, it is safe to say that at least 80% of all the heat of this gas will go directly out of the chimney, and this will be doubly true of a gas radiator, or other form of gas heaters. The only other style of Gas Heater on the Market which comes anywhere near being efficient in the way of a Radiant Heater is the open flame type of gas heater, and in a test of the Electrical Testing Laboratories at New York the Radiantfire showed to develop and give off four time more Radiant Heat than the best form of open flame gas heater. And it must be borne in mind the amount of Radiant Heat given out by an open flame heater depends very largely on the luminosity of the gas. New York City gas is about 20 C. P., therefore in the case of Natural Gas where it does not carry a very high luminous power the percentage of RADIANT HEAT would be very much less than this, so in proportion perhaps six or seven to one in favor of the RADIANTFIRE.

I have told you that RADIANT HEAT goes right thru space, all kinds of air currents and drafts without necessarily warming the air, and it is only absorbed or stopped when it comes in contact with some non-transparent body, but this is not exactly the case. RADIANT HEAT spends its energy in the square of the distance just the same as light, and if we have this

Radiantfire in an open vacant room directing it into space many feet away so that RADIANT HEAT energy will not come in contact with any solid non-transparent body when it spends its energy in the space, turning into CONVECTED HEAT, which rises upward. As an illustration of just what transpires take a cigar or cigarette if you will and blow the smoke right straight out, observing for some distance the smoke goes in a solid stream and then as its loses its velocity it begins to break and rise, so that it rises upward. RADIANT HEAT does exactly the same thing. A Radiantfire is just as effective as a CONVECTED HEATER as any other gas heater could be, and when RADIANT HEAT energy comes in contact with any solid non-transparent body, even the leg of a chair or side of a desk, your clothing or anv other object in the room, it constantly warms that surface it comes in contact with. Then in turn the air circulating around this surface is warmed, rises upward and is turned to CONVECTED HEAT.

I have told you from the beginning that CONVECTED HEAT and CONDUCTED HEAT play a certain part in all forms of heaters, and this is also true in RADIANTFIRES. The firebrick which you will observe in this Radiantfire absorbs heat but is practically a non-conductor of heat, so it isn't conducted away and lost, or given off in CONVECTED HEAT, but rather if you will observe after the Radiantfire has burned twenty minutes or a half of an hour the face of this firebrick becomes red hot, almost as hot as the radiants themselves and when it reaches this point and can absorb no more heat then the radiants become still more incandescent with heat and become more highly efficient in giving of RADIANT HEAT. There is very little heat lost in the way of CONDUCTION—that is by heat being conducted thru the metal or down the legs of the fire to the floor, and there is but very little heat lost in the way of CONVECTION. About the only CONVECTED HEAT coming from the Radiantfire is that which is given off by the hot metal or the framework surrounding the fire.

The RADIANTFIRE is the only Gas Heater ever produced which positively separates the heat and products of combustion.

Nearly all of or at least 80% of the heat in the gas is absorbed by those radiants, and if you could see exactly what happens, the heat turns at a direct right angle and is thrown right straight out into the room where you sit in the form of RADIANT HEAT energy, while the products of combustion rise and go right straight out of the chimney, if in a fireplace, or right straight up to the ceiling if in an open room. However they are preferably used in a fireplace because in so doing it is positively the most sanitary heating unit ever produced, because you get nothing in the room except pure heat energy just the same as the sun shining thru the window. From a hygienic standpoint RADIANT HEAT cannot be excelled because you get only pure heat energy, without the products of combustion necessarily contaminating the air in any way, and it is possible to sit in a fairly cold room and bathe the body in RADIANT HEAT without heating up the air of the room to such a temperature that the lungs are being filled up with hot air.

The ideal heating system would be to bathe the body in RADIANT HEAT and leave the air of the room fairly cold for breathing purposes. Furthermore, in a family of several people not all are in the same general condition of health. Some are robust or warm blooded while others are inclined to be anemic, and the use of a Radiantfire in a room would enable one to adjust their position in the room to a point which seemed to be most comfortable to their physical condition rather than all — both robust and anemic having to live in a temperature of air of the exact same temperature.

As a better illustration of just what transpires with RADIANT HEAT let me say that the sun shines down thru 93 million miles of space thru all kinds of atmospheres, drafts, air currents and will shine right through a plate glass window on a fairly cold day and warm you on the inside. There are no products of combustion or other influences in the atmosphere. You get nothing but the pure unadulterated sun-shine heat. On the hottest day in the summer when you are fairly sweltering down on the earth here, 23 miles upward it is 273° below zero, and still the RADIANT HEAT from the sun comes down thru all that space without necessarily warming the space up there, but as

soon as this RADIANT HEAT strikes the earth it is absorbed by the earth and then given off again in the form of CONVECTED HEAT, thus the reason why it is so oppressively hot here. If the earth was a mile or two further down away from us the intense heat wouldn't fall at this point.

After the sun goes down at night they say the dew is falling, but the dew doesn't fall — it rises. As soon as the sun has gone down the heat that has been absorbed by the earth begins to rise upward, and in doing so lifts a certain amount of moisture, which has been carried up from the earth by the radiation from the ground, and deposits same on the grass or trees. Why does the old farmer say in the Fall of the year "If it clears up tonight there will be a frost"? Why is there not a frost on a cloudy night? The reason for this is that on a cloudy night the clouds act as a great baffle over the earth and tend to hold the heat down to the earth, and therefore the flight of the heat from the earth is not so rapid, but as soon as we get a perfectly clear night and there is an unobstructed chance for the heat to rise, the rise of heat from the earth is so rapid that it chills the earth and a frost takes place, but it will be observed in a very frosty morning that directly under a large tree where there is foliage no frost takes place directly under the tree, for the reason the foliage from the tree tends to hold the free flight of the heat upward, just the same as the clouds do on a cloudy night.

Now this description of how the earth absorbs RADIANT HEAT and then gives it off again in the form of CONVECTED HEAT or hot air is a perfect description of how the floors, the rugs, furniture in the room, your clothing and all other non-transparent bodies in the room come in contact with RADIANT HEAT waves of the Radiantfire and then give it off in the form of CONVECTED HEAT.

In these days of very high cost of Fuel with no relief in sight there is a greater chance for economy in Fuel than almost any commodity we know of, and it is a certainty that we as a Nation must learn to conserve all fuel far more than we ever have before. What would you think of a man or woman who would light up every room in the house, no matter whether it be Gas or Electric, and leave those lights burning 24 hours of the

day, so that there would be light in the room in case they should happen to go in there any time of the day or night? Well, this is exactly what all of us are doing now in Heating. Everyone of you in your homes no doubt have at this writing a general heating system in the basement by which you are heating up every room in the house whether it be eight, ten or fifteen rooms, and the probabilities are there isn't anyone in the great majority of those rooms right now, and in several of them the probability is there won't be anyone for days to be at a time. And still you continue to consume fuel in your basement to heat up those unused rooms.

Furthermore, when you go to bed no doubt you open up the windows to let in fresh and cool air and sleep in this temperature with the heat turned on in the room, for in most homes many hours each day all of the family is out of the house and still the furnace is going heating up every room in the house. Why this terrible waste of fuel? Can you imagine what a boon it would be to the people at large if it were possible to snap on and off the heat in room as you go about from room to room, just the same as you do with your Electric Lights? Would it not be about as cheap to heat a house under such a system as it is to light it today?

It seems not to be generally understood by the ordinary housewife to turn off a certain radiator in a room or two involves any economy. The great majority of them seem to be under the impression as long as the fire is going in the furnace that there would be no economy in turning off one, two or three radiators in spare rooms not to be used, and it seems a great deal of good could be done in the way of educating the public in the efficient use of fuel. As a good illustration of what I mean by this 20 or 25 years ago when we first went into the Artificial Gas Business we were just then trying to introduce gas ranges for cooking purposes, but there seemed to be an impression at that time that only the idle rich could afford gas for cooking. It was then that we were trying to interest the middle and poorer class in the use of gas for cooking, with the result invariably when the new range was installed the bills ran very high, so there seemed to have been the realization on the part of the Gas Com-

panies that they must educate the Public at large to the use of gas for cooking. It happened to be one of my duties to watch high gas bills, then go to the customer who was running those high bills and give them a demonstration in the use of gas for cooking, showing the housewife how she must never light up a hot burner on the gas range until she wanted it, turn it low when the kettle began to boil, and turn it off when she was thru with it. And the same thing is true with the oven, with the result the Gas Companies in this country have educated the American people to such a point that today Artificial Gas at $1.00 per thousand is cheaper for cooking purposes than coal or wood, oil or other fuel.

Now, what has been done with Artificial Gas for cooking can be and will be done with gas for heating, because it isn't necessary to have the fire lighted up for an hour or two before heat is desired. A Radiantfire is almost like what hot water people advertise "Hot Water Always on Tap." Here is heat always on tap! — You light a match and get heat instantly, and why isn t this the ideal system for heating a home, or at least for a very large portion of the year in which now central heating plants are utilized? There are from six to eight weeks in the early Fall where only a small amount of heat is desired, this usually in the evening or morning—the same thing being true in the Spring of the year. And, still people everywhere are maintaining a large central heating plant in their basement, because they have not been taught the use of some room heater that can be utilized only when and where desired.

As a better illustration of the advantage of a Radiantfire and how you get instant results, we say if the room is dark you turn on the lights and flood the room with light instantly. Likewise if the room is cold you light the Radiantfire and flood the room with heat instantly. RADIANT HEAT travels at the same speed as light, 186,000 miles per second, so you can judge from this how quickly you must get results from a Radiantfire when used in an ordinary room.

An objection to Radiantfires has been that this is the kind of a heater when used you are burning up in front and freezing in the back. This statement only proves the effectiveness of

RADIANT HEAT. We are able to measure the value of any thing only by comparison, and the intense heat felt when standing before a lighted Radiantfire in a cold room is proof of the great volume of heat it is giving. But this objection is only temporary because as I have told you a Radiantfire is just as effective as a CONVECTED HEATER in a room as any other gas heater. The writer has been engaged in the sale of Gas Arc Lamps for many years and one of the objections to the use of gas lamps was they are too hot.

Ofttimes we have recommended to our customers that they install electric fans to blow the heat away. Years ago many of our customers had us make up special ventilated lamps with an opening or connection for a vent flue. Then they connected this lamp up with a vent tube running up to the ceiling and along the ceiling to outdoors, supposing that they were drawing all the heat from the lamps and only the light was left in the room. Several years ago a firm in New York conceived the idea of connecting all their gas lamps up with a vent tube. Then they had an electric motor blower to draw the heat away from the lamps. I think this was known as the Rector system. No doubt we all meant well, but it is now I realize how we were fooling ourselves, as all the heat you could take away from those lamps even with a blower system was the convected heat or hot air coming from the hot metal of the lamp, but the great volume of heat coming from an Incandescent Arc Lamp is Radiantheat, which goes right downward the same as the light goes, and so no amount of suction or drafts would change its course. If you were to build a glass deck between yourself and the lamp a large percentage of the Radiant Heat would still come down thru. in fact Radiant Heat would come right thru the glass now if there was a globe on the lamp. It is only recently that I realized a lamp with an Alabaster or Opal globe on it was cooler than one with a clear glass globe on it, because the more dense the glass the more Radiantheat it will absorb, and this may be why there is more breakage on Opal or Alabaster glass than there is on Clear Glass, because the former absorbs more heat and therefore gets hotter.

It is noticeable that we seldom see a modern Tungsten or Nitrogen Lamp with an Electric bulb of Opal glass, and the reason given is they had such great difficulty from breakage.

In showing you this Radiometer I explained to you how it works, but there are two things happening here that no doubt most of you failed to take note of. The first is that in order to propel those paddles the Radiantheat must go thru the glass, and second this bulb is a vacuum, therefore Radiantheat goes thru a vacuum and the reason why all vacuum bottles have a silver lining like a mirror is to reflect away the Radianheat. If a vacuum bottle was of clear glass, Radiantheat would go right thru the glass, the vacuum, and heat up the contents almost as quickly as if it were a plain glass bulb.

If I have made any misstatements or misrepresentations in reference to RADIANTHEAT I should be glad to have anyone correct me. I will also gladly undertake to answer any questions referring to RADIANTHEAT either now or later by correspondence.

DISCUSSION

PRESIDENT OLIPHANT: Mr. Conroy, you certainly delivered a very interesting and instructive talk in addition to the presentation of a very valuable paper. Now, gentlemen, are there any questions or any discussion?

MR. ROSSWELL H. JOHNSON: Mr. Conroy, would you please discuss the advantages of the latticed clay work upon the Radiant Heat stove which you have used in that demonstration?

MR. CONROY: The lattice clay work is simply a composition of, clay or it may be of some other similar material that is very porous and instantly absorbs heat, — very much the same as a sponge will absorb water.

This latticed clay work that you see in front here absorbs this heat and becomes red hot. Mind you, any red hot surface casts off heat. You do not have to have a particular composition; a piece of iron or a piece of metal would answer the same purpose but we have used in this instance this clay because as I say it is very porous and instantly absorbs heat. There is nothing particularly suggestive or important in the particular kind of

material to be used for this purpose. We have simply used this porous clay because of the better results we get from its use. Of course, this never burns out but instantly absorbs the heat and we get results so much quicker by use of some such material. If cast iron were used it would take probably twenty minutes or a half hour to heat it up, because it will not absorb the heat so fast.

PRESIDENT OLIPHANT: Any other questions or discussion, gentlemen? If not, I wish to thank Mr. Conroy on behalf of the Association.

The next paper on the program is by Mr. I. Lundgaard on the subject

"THE GAS COMPANY'S OPPORTUNITY IN THE APPLIANCE BUSINESS."

I take great pleasure in introducing to you Mr. Lundgaard.

MR. I. LUNDGAARD: Ladies, Mr. Chairman, and Gentlemen: I owe to you an explanation, that I am not a natural gas man and I do not know anything about the natural gas business. I am in the artificial gas business and I am told that some of you are going to be in the artificial gas business before long. So I thought possibly we may meet today on the same plane. The subject of my paper is "The Opportunity of the Gas Company in the Appliance Field," and I have attempted to cover this subject from a particular point of view. I would like you to feel that there is something more behnd it than the mere selling of gas stoves and furnaces. There is something of greater importance back of an appliance campaign than the mere selling of gas and the making of money on the sale of such appliance.

Mr. Lundgaard then presented the following paper:

THE GAS COMPANY'S OPPORTUNITY IN THE APPLIANCE BUSINESS

By Ivar Lundgaard

The foundation of all satisfactory business is mutual confidence and trust. The buyer must feel assured that he will obtain from the seller the goods for which he has agreed to pay and that his purchase when delivered to him in the manner agreed upon will serve his purpose better than any other purchase he might make for the same purpose. Only then is he thoroughly satisfied and the wise seller is he who realizes the perfect identity of his own interests and that of his customer. The wise seller, furthermore, knows that not only must he know his own wares but that he must be fully conversant with the use that the customer makes of them, for only then can he fully satisfy himself and his customer that the business transaction is meritorious.

Mutual confidence is the foundation of satisfactory business. Whatever our place or function in business may be, let us keep this fundamental law before us and let us be guided by it in all our endeavors. I am not here to talk business precepts to you but it is my hope that what I have to say will be construed by you as being inspired by the principles of good business and will enable you in some way to more nearly realize their full incorporation in your activities.

A public utility occupies a vulnerable position in the community in which it operates. It must give service to all applicants for service. It cannot select a friendly understanding clientele. It is safe to say that those of the utility's customers who have no knowledge of facts will not voluntarily assume that their utility corporation is a noble and unselfish institution. On the contrary, they assume that the utility corporation is malicious and corrupt, and of all hearsay information and misinformation which is gratuitously offered, they absorb mostly that which confirms their evil suspicions. People so disposed are enemies of

the utility and when the utility corporation is forced to make an appeal to the authorities and to the public for relief from economic conditions threatening its existence, the motives and the statements of the corporations are branded as false and malevolent, and even decisions of Public Service Commissions and the courts are accepted as the results of corruption. The amount of illwill harbored against some utility corporations is a real menace to the community served as well as to the corporations themselves. Let us not be blind to the facts but face them as they are.

It is far from my intention to opine that public utilities in general and gas companies in particular do not possess a gratifying measure of confidence and goodwill of their patrons but none of us is so perfect that he may not willingly admit that there is room for improvement.

Whatever our claim may be toward better business — bigger sales, increased revenue, more capital — we need this foundation of goodwill and confidence, and the firmer it is, the better it is for all concerned. I shall limit my discussion to only one phase of the task of establishing this basis of better business. There are many contributing factors and many ways in which the good will of the public may be secured but none better and surer than intelligent aggressive commercial activity on the part of the gas company.

It is an old and time-honored saying that "The proof of the pudding is in the eating." A consumer who personally receives tangible proof of the goodwill and competency of his gas company is a better friend of the company than one who only hears neighborhood talk and reads the newspapers. The consumer who has one personal experience that has shown him that the gas company knows its business and is disposed to deal fairly with him is more willing to take the gas company's side in an argument. The community that has been impressed with the aggressiveness and efficiency of its gas company stands ready to give it a fair deal. Consider for a moment two gas companies pursuing different policies.

Gas Company No. 1 apparently takes no interest in its consumers beyond delivering to them once each month a bill for gas

consumed and collecting the money therefor. The consumer must rely on his own resources in the selection of the gas consuming devices he needs and having little or no knowledge of the relative merits of such articles, he usually manages to get together a collection of appliances that not only is unsuited for his needs but is inefficient and troublesome. The gas bills are high and the benefits received are small. He is not a satisfied consumer of gas.

Gas Company No. 2 maintains a sales department. It has clean-cut, courteous, capable salesmen and engineers that go out and study the consumer's requirements and offer to him appliances which they know from tests and experience to be suited for the consumer's needs and to be the most efficient appliances to be had. The staff of the company's domestic sales department is always ready to give advice in regard to home lighting, heating and cooking, and the industrial engineers prescribe or design and build furnaces for all sorts of manufacturing processes to the entire satisfaction of the consumer. Gas Company Nos. 1 and 2 from a public policy point of view may be aptly likened to two farmers, both having the same seed, but one of whom scatters the seed broadcast while the other plants his seed in a carefully prepared soil. The one reaps disappointment, the other a golden harvest.

The gas companies are fortunate in having a wonderful opportunity through their new business departments to get in direct personal touch with their customers — to create a business friendship based on service and mutual respect. Whether a new business department in itself is a paying institution or not is of minor importance. Some sales departments yield direct profit, others do not, but the community or the gas company never loses by their activities. The natural gas companies may not be interested in increasing their sales. They may, however, be interested in raising their rates, and if this matter were considered more as a work of the sales department than a function purely and solely of the law department, much grief and expense would undoubtedly be saved.

The following discussion of the various phases of the work of obtaining efficiency in utilization of gas is intended to briefly

outline the reasons for injecting into the field of utilization more expert knowledge and to show you that there exists a real opportunity for service both to the consumer of gas and to yourselves.

Rapid progress is being made in the better utilization of gas fuels. Development of more efficient appliances has followed closely the better understanding of the nature of the problems involved and various factors through which greater conservation may be accomplished. Gas is recognized as the most perfect fuel and as such as being capable of utilization at the highest efficiency. It must be admitted at the same time that no fuel can be more easily wasted. It would be impossible in a few minutes to more than barely outline the elementary principles underlying efficient use of gas and I realize that the following brief resumé of knowledge upon this subject can only be useful to you as an indication of lines of further study and I urge that you as individuals and in association give the whole matter serious consideration. There is more than a technical achievement at stake. The welfare of the gas business is and will be in a large measure proportional to our knowledge and application of correct principles in the utilization of gas.

INSULATION.

The first and most obvious step to take for conservation of gas is to heat insulate the space being heated. If an oven is constructed with little or no insulation, the heat loss through its walls is great and the expense for gas is large, but the oven itself is inexpensive. If heat insulation is added, the heat loss is decreased while the expense of construction is increased. It can be mathematically proven that the maximum economy obtains when the cost of the heat loss for a given period of time is equal to the fixed charges of the additional expenditure for heat insulation for the same period of time. For given conditions of price of gas and heat insulating materials, the working temperature and the load factor of the oven, the amount of heat insulation required for maximum economy can therefore be readily determined. There is perhaps no field in which neglect of simple economics is more prevalent than in the field of heat insulation

as evidenced by an inspection of appliances offered by manufacturers.

CORRECT COMBUSTION.

When gas is burned, an amount of air just sufficient for complete oxidation of the gas should be admitted to the flame. If less air is admitted, the combustion is incomplete; if more air is supplied, part of the heat of combustion is consumed in heating the excess air, and in either case gas is wasted. The amount of heat available for work in any furnace is the amount of sensible heat contained in the products of combustion at the temperature at which combustion takes place and the temperature at which the flue gas leaves the furnace minus the heat leakage of the furnace itself. The effect of excess air is twofold: it not only decreases the temperature of combustion but it increases the temperature of the exhaust gases and therefore doubly decreases the margin of available heat in the products of combustion. This is a well established theory and practical tests have proved that the loss due to prevailing faulty combustion is appalling. No subject can be more worthy of your consideration than this if you desire to conserve gas.

The remedy lies in improved design of mixers when atmospheric burners are used, and in the employment of automatic combustion control where blast burners are used. The most complete source of information in regard to combustion of gas is found in the 1919 Report of the Committee of the American Gas Association on Proportional Mixing and in the Report of the Committee on Atmospheric Burners.

RECUPERATION.

A most encouraging sign of the times is the wide interest manifested in the recuperation of the heat contained in furnace exhaust gases. Recuperation in various forms has been in use for large furnaces for years and is now being frequently applied to even quite small furnaces. The possible saving is greater for the higher working temperatures but it is amply demonstrated that recuperation pays well at working temperatures as low as 1000° Fahrenheit.

In order to recover waste heat from the flue gases, it is necessary to provide some means of transferring their heat to the air applied for combustion. The simplest form of a recuperator is a pipe coil installed in the exhaust flue, the air for combustion being carried through the coil and heated by absorbing heat from the flue gases. The heat thus added to the air before it reaches the flame raises the temperature of the gas flame and therefore increases the margin of heat available for work in the furnace. Saving in gas consumption of 50% and more is readily possible for high temperature processes.

Another way of recovering heat from the exhaust gases is that of building the furnace in accordance with the principle of counter-current heating. Here the material to be heated moves in the opposite direction of the furnace gases so that cold material entering the furnace first absorbs heat from the relatively cold flue gas and as it passes forward either by stages or by continuous conveyor movement constantly gets in contact with the higher temperature of furnace gases until it reaches the point of final temperature and is removed from the furnace.

OTHER DESIGN FACTORS.

Inasmuch as the heat loss of any given type of gas appliance is a function of the size of the exposed surface and hence of the size of the heated space, it follows that the appliance should be well adapted to the work to be done as to its size. The ratio of the space available for work in an appliance to the total space subject to heat is termed the space factor of the appliance. A careful designer will keep the space factor at the highest possible point and the careful sales engineer will advise the use of the smallest appliance that adequately meets the requirements of the consumer's work.

The radiant form of heat is most readily absorbed by the material to be heated so that wherever possible the appliance should be so designed that heating is accomplished by radiation to the greatest extent possible.

Intimate knowledge of materials suitable for construction of heating devices is important so that in all cases the material most suited for the purpose is selected and the amount of heat

absorbing material is limited to that required for strength and durability. Excess material involves heat loss and construction expense.

The use of the proper form of burners and furnace accessories is another fertile field for study and research and is recommended to your attention.

PERFORMANCE STANDARDS.

The establishment of methods of accurately determining the relative merits of different makes and kinds of gas consuming devices is a matter of utmost importance. The American Gas Association is now attempting to formulate such standards and the co-operation of the Natural Gas Association of America in this work would be greatly appreciated. The Bureau of Mines is at present engaged in a series of tests of cooking and baking appliances and is co-operating with the American Gas Association Committee as to the best methods of conducting tests. It is confidently expected that when the efficiency of gas appliances is made a matter of scientific determination, competitive conditions will force manufacturers to pay increasing attention to excellence of design and construction details. The "price and beauty" contest now going on is not a worthy spectacle to behold.

CONCLUSION.

In closing I wish to leave these thoughts with you.

The subject of utilization efficiency of gas is not one that you can expect a layman to do full justice to — it is beyond him. The great mass of consumers needs your advice and guidance as much as they need your product. Your activities in the "field" cannot be gauged as to their success by inspection of the profit and loss column of the new business department. The result of this department's work in terms of public goodwill is the real measure of its success, and the prosperity and welfare of any public utility rests on this.

In making your decision as to whether or not you are to go into the appliance business, take a broad view of the whole situation.

DISCUSSION

PRESIDENT OLIPHANT: Now, gentlemen, Mr. Lundgaard has kindly consented to enter into any discussion or answer any questions thatmight be asked him. Are there any questions or discussion?

MR. GEORGE D. ROPER: For a number of years I have tried to break into the natural gas business along the line of stimulating the manufacture of efficient appliances. We have been looking for some one for a good many years who might lead us to an appliance which would be efficient and which would give us a satisfied customer. But we have been playing along the side of the road and taking the appliance just as it came to us on the representations as presented by the plausible, pleasing personality of the appliance salesmen. I was in hopes that we might at this convention create a fund which would stimulate the genius of some inventive man to come forward with an appliance which would be economical and efficient and I certainly appreciate this paper of our friend who has just made an argument along the same line which it seems to me is most convincing. I think it is one of the most important things for us to do. We must in some manner, somewhere, somehow either by money or by some other method bring forth something that we all need and that is an efficient gas burning appliance. The Bureau of Mines is considering something of that kind and I understand that this Association is to recommend renewed efforts along the same line with that object in view. But in addition to that the ordinary fellow, who sometimes puts across a good thing, does not have the money, after he has perfected his appliance, to put it on the market and to advertise it. If such an appliance is in existence or is in the mind of any of these ordinary fellows or even in the mind of a genius I think the Gas Association ought to go to him and say, "Here are a few hundred dollars which you may use to secure and perfect an efficient appliance and to assist you in putting it upon the market; and this association will aid you in getting that efficient applance into the hands of the consumer as quickly as it can", and in this way put a little pep in him and

stimulate the producing and the marketing of such an appliance which is of such great need and of such universal benefit.

PRESIDENT OLIPHANT: Any further discussion, questions or remarks?

MR. MILES B. LAYTON: I would like to apologize to begin with because I am like the gentleman who read the paper; I am not a natural gas man. It is a matter, however, of great pleasure to find a young man who will get up and read a paper such as he has written that we older fellows have been howling so long about. It only proves that if you will everlastingly keep at it you will accomplish something. There is no question but what in his paper he has given some very important facts. On the cursory reading it is a little technical for me. The man that is technical can educate the engineers but what a man has to do in the appliance business in order to make a success of it is not to be so technical but to so conduct a campaign of education that he can keep next to the consumer, for the consumer does not give a tinker's dam about how many B. T. U's there are in the proposition or C O 2's or anything of that kind (applause) but the question they want answered is "How much can I get out of it"? (renewed applause). To tell you the honest truth I would like to have had time to study this paper a little because there is so much real thought in it that it really takes time to properly and thoroughly digest it. The principal thing in my mind and aways has been is that the man, in order to make a success of it, has got to take an interest in his own goods and he has got to sell himself first. The gentleman who just spoke talked about the manufacturer, a salesman coming in and selling him but I will gamble that he don't talk technicalities to him. If he has put over something on him that is not just what he thought it ought to be that is his fault. There are appliances on the market to-day that have been demonstrated to you which would give you satisfaction, but you have been sitting on a soft seated chair wondering why some fellow don't come around and sell them for you. In my younger days I went up to sell a man at Kalamazoo. At first he was not particularly interested, was very indifferent and finally said, "There is a gentleman who just walked by the window who will buy a stove if you will go out and sell it to him".

I told him I had not come there to go out and sell anybody who might happen to walk down the line but I was there to sell him and to sell him only. There are too many people that want somebody to come in and do the job for them. As far as the technical field is concerned the average consumer does not understand what you mean. You talk to him about perfect combustion. You tell him what perfect combustion is. My idea of perfect combustion varies widely from that of the high class engineer but I can convince a man that don't know. But perfect combustion so far as gas appliances are concerned and the amount of air that it takes is much more easily explained by saying "if you will light a flame you will see a certain result and if you turn on the air this way you will see a different result and if you turn off the air so it shows the illuminating tip and then cut that down so it just misses and has a violet look to the gas instead of the green core that the ordinary technical man calls perfect combustion you will get more heat units than you can out of what is commonly called perfect combustion". By demonstrating that to the consumer by actually doing it in his presence is a much quicker and more satisfactory way of educating him in the proper use of gas through that burner. Talk of "perfect combustion and B. T. U's" has nothing to do in my mind with the principal part of the appliance end of the business. The appliance end of the business is for you to sell the most efficient gas appliance you can secure for the proper utilization of the gas that the consumer takes from the gas company.

The whole world is prejudiced against corporations regardless of whether they are public service corporations or not. There is a prejudice there that you start with and the gas company is in a better shape to demonstrate the advantages of its product if it has an efficient appliance on its floor which it can sell and with reference to which the representatives of the company can talk directly to the consumer about. Don't be afraid to differ with them in their opinions. If you will stand up and convince yourself and know that you are in the right then after you have first sold yourself do not worry about selling the man that comes in to buy and he says "I have been using so and so because my grandfather used it before me and therefore I am

going to use it too" and all that kind of rot. Put it on your own floor and first convince yourself and then you have convinced ninety-nine out of every hundred consumers who come in and tell you they would not have it. There is no question about it. If the gas company would avail itself of all the opportunities it has of inducing the consumer to come to its office you can readily see what an advantage the company has to demonstrate to the consumer the truth of what he wants to convey to the public. Compare the gas company with the telephone company. The telephone company has a man that is kicking because — as I heard a man say at the vaudeville theater the other night when he asked of central "What wrong number can I ask for so that I can get 226 quick?" (laughter). That puts it one way and puts it very forcibly. "What wrong number can I ask for so that I can get 226 quick?" The man who is complaining over the telephone has his message received a mile or two away from the point where he is registering the complaint and the man who makes the complaint does not know whether he is talking to the office boy or the President of the Company and when he tries to explain it to him he hangs up the receiver and the man at the other end of the line does not hear the rest of the conversation. But in the gas business you can get that man into your place and you can convince him by actual demonstration on the floor the truth of what you are saying to him and ninety percent of the times it is the same fuel applance that he is kicking about and you can tell him about it and you can show it to him and you tell him why he should do this and why he should not do that and you can say to him "I don't care whether the flame is six inches long or six feet long, you can see that there is only an inch at the top of it that you are getting any results from; then why burn all the rest of it?" And you can show to him that the more pressure you have got the harder that flame comes up against the bottom of the vessel, and you can demonstrate to him the exact amount of pressure he should have in order to arrive at the best results. You might say he is running a radiant heat establishment as was demonstrated by Mr. Conroy here a few minutes ago. You can demonstrate to him the fact that he is simply wasting the fuel; you can show to him the reason why

an appliance can be used under a certain pressure and the disadvantages that he will encounter if he uses the gas at a pressure which is not necessary or at a pressure where he is not getting the best results. Don't commence by teaching your consumers how to regulate the supply of gas and expect them to do that for you; don't teach them how to use the cock handle or wheel or whatever it is that you use. The manufactured gas people made that mistake and they have had it to contend with. The thing you must do is to give service and good service and demonstrate to the consumer the best way in which he has of utilizing the gas that is served to him. Now, that is all there is to the question. You cannot give service unless you start with the consumer. So far as the natural gas people are concerned, according to my way of looking at it, you are up to the point where the producer, the distributor and the consumer have all got to come down the middle of the road together. They cannot be pulling separately and hope to get bust results or the best service. I understand they have been pulling separately more or less in the past. At least, our experience is that way but we must all remember that we cannot all go on different roads, each diverging from the other, and ever hope to meet. All three have got to come down the middle of the road together. I thank you. (Applause).

PRESIDENT OLIPHANT: Any further remarks, discussion or questions, gentlemen?

MR. E. B. KELLOGG: I want to amplify a little bit the remarks of the gentleman over here in regard to the activity of the Association on new devices. I had a little experience along that line which will illustrate perhaps the point I had in mind. I conceived the idea of applying the radiant heat principle to overcome some of the defects in natural gas ranges which are so well illustrated by the Government exhibits.

I spent considerable time and considerable money but have been unable to work out that idea. I believe it could be worked out. When you consider the thousands and thousands of gas ranges which are in use and the necessity of delivering gas under a lower pressure there is a possibility there of working out something that would help save an immense quantity of gas

when considering the wide scope it would have. I think it would be a matter of consideration for the Association or for the Directors or whoever would be the proper authorities to provide some clearing house where some of these things might be able to be worked out or where a man could get information or some help to put some of these things across.

PRESIDENT OLIPHANT: Just along that line I might say to you and to all present that we have always stood ready to assist in the development of any device which would work for better efficiency in the use of gas. We are not only working with the Bureau of Standards along that line but we are always ready to work with anybody who is experimenting along these lines and to give them all the help we possibly can. If there is anybody in this room who has any idea which he thinks, if developed, would work for greater efficiency if he will write to the association or to Mr. Way, our secretary, or to whoever he may know connected with the management of the affairs of the Association, he can be assured of the help of this Association and we will give to him all of the assistance and encouragement within our power. It has always been the policy of this Association to help along lines of greater efficiency. Indeed that is the prime object of the Association; it is not to keep anybody back or any appliance back but it is to encourage and assist in the development of any appliance or device by anybody which would work toward a higher degree of efficiency.

MR. WILLIAM H. MCKENZIE: Mr. President; as I see the condition today I do not believe it is the manufacturers fault that any gas company has not been selling proper appliances. We have been laying, so to speak, dormant a good many years in regard to our appliances. When we did wake up to the fact that the consumer did not have the proper appliance then we began to interest ourselves and my experience has been that if the distributors or the gas companies could work out an appliance adaptable to our situation we would not have any trouble then in getting into correspondence with the manufacturers and they would immediately have representatives on the ground and they would stay with us as long as we wanted them to and with their aid and with our assistance we would work things out. Speak-

ing with reference to my own situation we had a very very bad condition there in the way of appliances but as I say we woke up to the fact that such a condition existed and we immediately commenced to work in conjunction with the manufacturer of stoves, who sent their representatives on the ground and assisted us in every way they could. It took us some time to realize what we wanted but finally we have worked it out and we have good appliances now in the way of cooking stoves, in the way of heating stoves and other appliances. I think if we maintain what we have got now and go on and make as many improvements as we can, we would not have any trouble at all in having complaints come in the office in regard to the working of the appliances that we are putting out today, with the raised burner, the adjustable orifice and things of that kind and in cutting the pressures on your distributing mains to a sensible degree. The point I want to emphasize is that there is not a gas company in the United States but what has ready access to the different stove manufacturers and those manufacturers have shown a desire on their part to assist the gas company in any and every way they can. I believe the gas company can get the most benefit from any such campaign by having the manufacturers of the appliances to meet with the representatives of the gas company on the ground and to keep them there until by the combined efforts of both something has been worked out that will solve the difficulty at hand. (Applause).

MR. PAUL R. JOHNSON: We have been keeping in stock for a great many years appliances of all kinds and furnishing burners that will burn from 150 to 300 feet an hour down to one that will not burn over 20, and as I see it — and I do not want to talk very long on the subject — but as I see the whole situation the stove manufacturers all over the country are working for efficiency. The first thing, however, I think to do is for the gas company to supply the gas at a given pressure, be that pressure whatever it may. If it is only an ounce it is all right but in any event maintain a normal pressure and maintain it all the time and the stove manufacturers will take care of the rest of it. But to satisfy the consumer we must have gas where a given pressure

is maintained, not one ounce today and six ounces tomorrow but continually furnish the gas at the same pressure.

MR. FRANCIS P. FISHER: Mr. President, I think Mr. Lundgaard has performed a great service to the association by bringing to our attention these fundamental principles of design which should guide us in the future in the development of gas appliances, and particularly in calling our attention to the basic principles pointed out in his paper and especially that of coming in personal touch with the consumer, which principles I regard as of the greatest importance in the successful management of any gas company. The consumer does not want to have things given to him. He does not want to have anything for nothing, he does not even want to have it at a large discount but he is willing to buy whatever he needs, allowing the other fellow a good profit. But after he has once come in personal contact with the gas company a relationship is established there that tends to make him your friend. If it is not premature I would like to move a voet of thanks on the part of the Association to Mr. Lundgaard for his very excellent suggestions.

MR. GEORGE D. ROPER: I second the motion. I do not want to get into any argument especially with reference to the appliance end of the natural gas business but at the present time the stove business is in such a condition that no gas man should hesitate a minute to tell his consumers what he wants and tell him truthfully the situation just as it exists and at the same time bring to his attention the new and modern appliances which are at his command. Without going into any personal matters I may say that it can be demonstrated with the same stove, the same adjuster and the same valve; we can burn gas from a one ounce pressure to seven ounces. And it is not necessary for the gas stove people to make anything only what they are making now, if you will only make the consumer use what is made now and discard what was made in your grandfather's time. Now, this whole thing resolves itself down to a point that is well illustrated by an experience I had some years ago in the city of Cincinnati in a prominent factory there. The proprietor was taking one of his friends through the factory to whom he had sold his product for a number of years and he noticed that he was trying to avoid

one corner of the factory and his friend said to him "What is the matter with that piece of machinery you have over there in the corner?" The proprietor said "I was in hopes you would not see it, we have a press over there that I would not show to my brother". And his friend insisted upon seeing it but the proprietor maintained that he did not want to show it to him. Anyhow to make the story short he finally prevailed upon him to go over and look at it and his friend said: "Tom, I don't blame you for not wanting to show that piece of machinery for I would not show it to my grandfather" and it then developed that that piece of machinery had been in that factory for forty odd years. Now, that is an illustration of what you are afraid of. You have been asleep at the switch many of you and you have forgotten that there is something new or you are afraid to try it. You have been asking yourselves all the time, "What am I going to do?"

As I said in the start I think we should stimulate the manufacture of the most efficient appliances that can be developed and then by personal contact with the consumer demonstrate to him that it is capable of giving satisfaction and from that time on you can be assured of a satisfied consumer.

PRESIDENT OLIPHANT: Gentlemen, it has been moved by Mr. Fisher and seconded that we give a vote of thanks to Mr. Lundgaard for his very excellent paper and I suggest that as a tribute of appreciation we vote on the motion by rising to our feet.

A rising vote of thanks was then tendered to Mr. Lundgaard amid applause.

PRESIDENT OLIPHANT: Mr. Way wants to talk to you for a moment on the matter of research work.

SECRETARY WAY: In line with the discussion that has followed the reading of Mr. Lundgaard's paper and supplementing what President Oliphant has said with reference to the work engaged in by our Association in the way of encouragement looking toward the development of efficiency in the way of appliances I want to say that the Association has for a year been working on a concrete plan of a Central Research Bureau, but it takes a lot of money and time to install such a bureau

and equip it properly; so that we are not at this time in shape to present it to you. We had the plan pretty well developed when just recently — not over three weeks ago — Director Van H. Manning of the United States Bureau of Mines, in a Committee meeting of the National Natural Gas Conservation Committee at Pittsburgh submitted a complete plan for such a Central Research Bureau, to be supported by the Natural Gas Association of America and by The American Petroleum Institute and the American Gas Association, working in conjunction with representatives of State and Federal bodies. So that anybody who had an idea to develop along these lines would have a place to go to receive help, encouragement and assistance, as all of those things were to be taken up in that research. Fundamentally, the idea was to have the Bureau to become of such prominence and backed by such authority carrying the stamp of approval of the Government that there could be no question as to the results obtained or as to any statements following the thorough investigation which would be a part of the work of that Bureau.

Mr. Layton: Mr. President, I do not want to be misunderstood as to the idea I had in mind when I spoke. I knew of the work being engaged in by this Association and hundreds of Associations in conjunction with Dr. Manning of the United States Bureau of Mines, when I made my remarks a few minutes ago, but the thing I wanted to impress upon the members of this Association was to put our shoulders to the wheel as individual members, putting our money into it if necessary to help the good work along. I think that is what we need. I was not ignorant, Mr. Secretary, of what was going on or what your Association had been doing but I was simply urging the individual members of your Association to see to it that they did help it along and put life and energy into the effort to bring forward and develop the most efficient appliance that can be developed and enthusiastically put it across.

And thereupon, the above motion, having been duly seconded, was unanimously carried.

President Oliphant: Gentlemen, that will conclude the presentation of papers at this session and at this meeting, and at

this point I want to say I think every paper that has been read here is a classic. It is not only a classic but it is something that you can refer to and that we can all refer to in our business relations and dealings both from the standpoint of the consumer and from the standpoint of the operator in the production, distribution and consumption of the future supply of natural gas.

I want to express at this time, on behalf of the Association and myself, personally, sincere thanks to all of the gentlemen who have done such excellent service and who have worked so hard in presenting these most interesting and instructive papers to our membership at this The Fifteenth Annual Meeting of the Natural Gas Association of America.

The next order of business upon the regular program is the report of Committee on United States Bureau of Standards. I happen to be on that Committee and I will read the Report of the Committee, which is as follows:

REPORT OF ADVISORY COMMITTEE ON STANDARDS FOR GAS SERVICE

Natural Gas Association of America.

GENTLEMEN: As your representatives on the Advisory Committee of sixteen gas engineers, working jointly with the United States Bureau of Standards, Washington, D. C., in the preparation of a revised edition of the Bureau's Circular No. 32 on Standards for Gas Service, we submit the following:

We have had a long conference with the Bureau, have carefully gone over the manuscript copy above referred to and have made a number of suggestions which have been embodied in the revised draft of the manuscript of this Circular. The Bureau expects to have this Circular, as now revised, printed in the near future and it will then be available to all interested parties.

Respectfully submitted,

B. C. OLINHANT,
SAMUEL S. WYER.

After reading the above report, President Oliphant said:

Gentlemen, if there are no objections to the report as read, it will be received, filed and spread upon the minutes of this meeting.

The next order of business is the Report of the Publicity Committee, of which Mr. Harry J. Hoover, of Cincinnati, Ohio, is Chairman.

Mr. Harry J. Hoover then read the following:

REPORT OF PUBLICITY COMMITTEE.

To the President and Members of the Natural Gas Association of America.

GENTLEMEN:

At the first 1919 meeting of the Board of Directors of the Association a Publicity Committee was appointed by President Oliphant.

The Committee consists, in addition to the Chairman, the following:

Messrs. R. W. Gallagher,
L. B. Denning,
H. A. Quay,
J. H. Maxon,
Larmour Adams,
K. C. Krick,
Carroll Miller,
J. B. Tonkin,
O. K. Shannon,
S. S. Wyer, and
Wm. B. Way.

The first meeting of the committee was held in Pittsburgh, June 20th, 1919. The committee approached the task of forming concrete plans with the understanding that little expense be involved in the first year's work. Two concrete suggestions were adopted. First — that each company member be asked to name some one from its organization as a rate correspondent to furnish such information as would be contained in a question-

aire to be sent to each company member by the Secretary of the Association. Second — that each company member be requested to name a publicity correspondent from its organization — this correspondent to systematically send to the Secretary's office copies or clipings of all publicity matter, both paid advertising and rate matter, that may appear from time to time in the columns of its local press or other medium having anything to do with natural gas. This compilation of rates and advertising matter in the Secretary's office to be so filed as to be available to company members who may be interested in its use for local publicity.

As a result of this action the Secretary prepared a very comprehensive blank or questionaire and mailed same to the various company members rate correspondents. The response has been very gratifying and the Association now has on file a very complete and valuable compilation of rates and rate history. The response to the request from publicity correspondents has not been so complete. However, much information and data that would prove valuable to company members in publicity work has been gathered.

The Committee cannot too strangly urge the value of proper publicity as a means of education of the gas buying and the bringing about of a more complete understanding of the many problems confronting the natural gas industry.

It is the belief of the committee that this feature of the Association work should be pushed with great energy and perhaps a publicity department established within the Association.

It has been the purpose of the present committee and it should be of any future committee to coordinate the ideas and policies of the various natural gas interests so there may be no serious conflict of policy with regard to publicity work.

The committee respectfully suggests that the incoming Board of Directors give prompt and serious consideration to the publicity features of the Association work at its earliest meeting.

Respectfully submitted,

H. J. Hoover,
Chairman.

PRESIDENT OLIPHANT: Gentlemen, you have heard the report of the Publicity Committee; if there are no objections, it will be received, filed and spread upon the minutes as read.

The next order of business is the Report of the Committee on President's Address.

SECRETARY WAY: The report of the Committee on President's Address has been submitted to the Secretary, duly signed by the three members of the Committee. With your permission I will read the report.

And thereupon, Secretary Way read the following:

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS

GENTLEMEN:

Your committee, appointed to consider and report upon the President's Address, submit for your consideration the following report:

Our President emphasizes the necessity that confronts those responsible for utility operations of convincing the people that the public interest and the interest of the utilities are identical and cannot be separated; that the utilities must be prosperous if they are to properly serve the people, and that the truth about the utilities is the best and most effective argument in support of these facts.

The distribution of information to the industry, referred to by our President, has been of great value and a continuation of this work will be of great benefit. We urge the membership to carefully read and consider the valuable and important matters so ably presented by the President in his address.

J. H. MAXON,
G. F. BATCHELOR,
R. W. GALLAGHER,
Committee.

PRESIDENT OLIPHANR: Gentlemen, you have heard the Report of the Committee on President's Address; if there are no objections it will be received, filed and spread upon the minutes of this meeting.

The next order of business is the Report of the Committee on Next Place of Meting. Mr. Francis P. Fisher will make the report for the Committee.

MR. FRANCIS P. FISHER then submitted verbally the following:

REPORT OF COMMITTEE ON NEXT PLACE OF MEETING

Mr. President, and Gentlemen, I am not the Chairman of this Committee; I am the residue (laughter), the balance of the Committee having left town. In a way I might be considered the victor (more laughter). There was full consideration given by this Committee as to the place to be selected for our next meeting and we were in receipt of two very cordial invitations. One from the City of Cincinnati, Ohio, delivered in person, very cordially, by Mr. Harry J. Hoover of that city. The other was delivered in the form of a letter which I would like with the permission of all to read. It is a letter from the Consumers Gas Company of Hot Springs, Arkansas, addressed to Mr. W. F. Booth, Manager of the Little Rock Gas and Fuel Company of Little Rock, Arkansas, under date of the 13th of May, 1920, and is as follows:

DEAR MR. BOOTH:

Hot Springs would like very much to have the 1921 Convention of the Natural Gas Association of America and the Association of Natural Gas Supply Men. We understand that the first mentioned convention meets at Buffalo, from 18th to 21st, inst., and the last mentioned at Buffalo, from May 17th to 21st.

Hot Springs has hotel capacity for 10,000 guests and a convention Auditorium that will seat 3,500 and with a very large exhibit space under the same roof.

In the way ot pleasure features, we have perhaps the finest Golf Course in the South, Automobile Drives, Horse Back Mountain Trails, Fishing, and in fact any form of outdoor amusement.

We have entertained many large National Conventions and have numerous State Conventions throughout the year. The delegates and guests attending these conventions have always left us with the warmest appreciation of accommodations furnished and hospitality shown.

This City would be an ideal central location, accessible to the Gas and Oil Fields of Oklahoma, Texas, Louisiana and Arkansas, and we feel sure that the Great Southwest would appreciate the honor of having these conventions held within this territory. It is our understanding that the Southwest has never been favored with these conventions.

We will greatly appreciate anything that you can do toward securing this convention for Hot Springs and assure you that the City Government and Citizens in general will do everything possible to make the stay pleasant and profitable for the delegates and guests.

Very sincerely yours,

CONSUMERS GAS COMPANY,

By L. E. DILLON, *General Manager.*

The committee was in receipt of expressions from many members of the Association favoring both of these proposed places of meeting. There are many reasons why it would be wise for the Association to recognize the Western members by selecting our next place of meeting nearer their homes and which, of course, would encourage and stimulate activities in that section of the country but the Committee finally decided to make this recommendation in view of the many matters that came before it that the next place of meeting should be in the City of Cincinnati, Ohio, whose accommodations we have so successfully experienced before and that the Committee submit as a part of its report the urgent recommendation that the cordial invitation of Hot Springs, Arkansas, be acknowledged and the further recommendation that the succeeding convention be held at that place. We, of course, would like to make this recommendation subject to the approval of the Board of Directors of the Association.

PRESIDENT OLIPHANT: Gentlemen, you have heard the report of the Committee on Next Place of Meeting and also the recommendations of that Committee. If there are no objections we will spread the same upon the minutes of this meeting.

Now, gentlemen, the next order of business is the Report of the Committee on Nomination.

SECRETARY WAY: The Report of the Committee on Nominations has been submitted and with your permission I will read it for the Committee.

And thereupon Secretary Way read the following

REPORT OF COMMITTEE ON NOMINATIONS

To the President and Members of the Natural Gas Association of America.

GENTLEMEN:

Your Nominating Committee offer the following names for election to office in your Association:

For *President* — H. J. Hoover, Cincinnati, Ohio.

For *Vice President* — L. B. Denning, Pittsburgh, Pa.
O. K. Shannon, Ft. Worth, Texas.
H. A. Quay, Pittsburgh, Pa.

For *Secretary and Treasurer* — Wm. B. Way, Pittsburgh, Pa.

Directors — T. O. Sullivan, Pittsburgh, Pa.; John J. McMahon, Cleveland, Ohio; Freeman T. Eagleson, Columbus, Ohio; R. G. Altizer, Charleston, West Va.; Alfred Hurlburt, Pittsburgh, Pa.; J. D. Creveling, New York City.

Respectfully submitted,

W. Y. CARTWRIGHT, *Chairman,*
JOHN B. CORRIN,
J. W. MCMAHON.

PRESIDENT OLIPHANT: Gentlemen, you have heard the Report of the Committee on Nomination; what is your pleasure.

MR. ROSWELL H. JOHNSON: Mr. President, I move that the report be received, that the nominations be closed and the nominees as recommended by the report be declared duly elected by the Association to the respective offices to which they have been nominated in the report of the Committee.

MR. WILLIAM H. MCKENZIE: I second the motion.

PRESIDENT OLIPHANT: Gentlemen, it has been moved and seconded that the report of the Committee be received and those

nominated be declared duly elected to the respective offices to which they were nominated by the Committee. Let us see if we cannot make it unanimous; all in favor will please signify the same by saying aye.

And thereupon, the above motion having been duly seconded, was unanimously carried amid applause.

PRESIDENT OLIPHANT: The next order of business is the report of the Committee on Memorials.

SECRETARY WAY: The report of the Committee on Memorials has been duly signed by the Committee and with permission will read it. It is as follows:

REPORT OF COMMITTEE ON MEMORIALS

To the President and Members of the Natural Gas Association of America.

GENTLEMEN:

Once more we lay aside the labors and duties of life to pay tribute of memory to those who have answered the call of the Great Power that guides our destinies and marks our every act and deed.

During the past year eight of our members have passed to the Great Beyond:

MCCULLOUGH, G. W.,
Land Agent, Manufacturers' Light and Heat Co., Pittsburgh, Pennsylvania.

HEATH, C. R.,
President, Middletown Gas Company, Middletown, Indiana.

LOWRY, F. M.,
President, Dominion Natural Gas Co., Buffalo, N. Y.

RHINELANDER, J. J.,
President, Duplex Wrench Co., Pittsburgh, Pennsylvania.

SOUTHWICK, E. F.,
East Ohio Gas Company, Cleveland, Ohio.

BOYD, H. T.,
Chemist, Ohio Fuel Supply Co., Homer, Ohio.

BOYLE, PATRICK,
President, Oil City Derrick, Oil City, Pennsylvania.

BROBST, A. H.,
Commonwealth Petroleum Corp., New York City.

They have solved the mystery of the great adventure — they still live with us in our hearts and our affection.

Respectfully submitted,

S. M. DOUGLASS,
L. B. DENNING,
R. W. GALLAGHER,
Committee.

PRESIDENT OLIPHANT: Gentlemen, you have heard the report of the Committee on Memorials; what is your pleasure?

It was then moved by Mr. Francis P. Fisher, duly seconded by Mr. Roswell H. Johnson and unanimously carried by a rising vote that the report be received, filed and spread upon the minutes ofthe meeting.

PRESIDENT OLIPHANT: Before calling for the Report of the Committee on Final Resolutions I want to say just a few words in regard to your next President, Mr. Hoover. His selection at this time is a most fitting tribute to the excellent work he has rendered in the past. He certainly deserves the compliment. He has been untiring in his efforts ever since I can remember, or have been connected with this Association. He has worked very hard for the success of the Association and his efforts have been along lines that by making him President of the Association I know you will have a man at the head of the Association in whose hands everything is going to be run for the betterment of our industry and the success of our Association and I am sure you will all be satisfied that so wise a selection has been made.

Mr. Hoover, I wish you would come forward and say a few words please.

MR. HARRY J. HOOVER, the newly elected President of the Association, was then escorted to the President's Chair, amid round after round of hearty applause, and he said:

Mr. President and Fellow Members: It certainly is with a very deep feeling of obligation that I express my thanks to you for the honor of becoming President of your Association. There has been a high standard of efficiency set by my predecessors who are men engaged for many years in our common industry and who have guided the destinies of this Association for many years so that it has become one of the largest and most active associations within the confines of this country. All I can say is that whatever energy and effort I can summon to my command, every ounce of it will be given to the welfare and betterment of the Association. I thank you from the bottom of my heart. (More applause.)

RETIRING PRESIDENT OLIPHANT: Gentlemen, I will ask your new President to take the Chair.

PRESIDENT HOOVER: The next order of business is the report of the Committee on Final Resolutions of which Mr. Lucius S. Bigelow is Chairman.

MR. LUCIUS S. BIGELOW then submitted the following:

REPORT OF COMMITTEE ON FINAL RESOLUTIONS

Before closing the sessions of the Fifteenth Annual Convention of the Natural Gas Association of America, it becomes the privilege of your Committee on Final Resolutions to bring before the members of this organization several interests that have aided greatly in making this convention a marked success from various angles.

We desire to acknowledge the exceeding courtesy of the City of Buffalo through Commissioner John F. Malone, of its Department of Parks and Public Buildings, for the use of its vast Broadway Auditorium for exhibition and convention purposes, and its Elmwood Music Hall for the purposes of the Association's annual banquet, both being granted without remuneration of any nature. Furthermore, for permission through the same channel which was graciously granted to erect the 81-foot tubular steel derrick on Lafayette Square, facing upon Buffalo's leading business street, upon which this Association was privileged to display a large sign announcing the Association's Con-

vention and Exhibition. This courtesy made possible a structure familiar to all natural gas men, and as it were, a monument welcoming the members of the Association within the city's gates.

Expressions of sincere appreciation are by this report extended to the Bureau of Mines, Department of the Interior, for its co-operation accomplished through the displaying of the most approved methods of natural gas service as applied in cooking-ranges and the allowing of members of its staff to be present and to conduct this exceedingly constructive feature at the Exhibition.

The Association is indeed indebted to the Henry L. Doherty interests for a most instructive, valuable, and pertinent exhibit, an ocular demonstration of the "Three-Part Rate" which is rapidly gaining favor. This exhibit though it contains several types of appliances has no object whatsoever other than the general benefitting of the industry and opening the way for a more commensurate charge for gas without adding burden upon the gas user, while materially conserving volume of gas as a direct outcome. The thanks of the Association are most earnestly extended for this co-operation.

The Association as a whole, and its members individually who were present at the annual banquet held in Elmwood Music Hall are greatly indebted to Hon. Walter E. Edge, who was the speaker of the evening, for his instructive and admirable address on "The Relation of the Government to Business," Senator Edge attending as guest of the Association.

We would bring to the fore the exceedingly excellent and thoughtful work of the Supply Men's Association in providing an exhibition so vast and so complete, notwithstanding the exceedingly adverse conditions which pertain on account of the embargo against freight, and the present notable slowness of the express companies in making deliveries of supplies sent forward by express for display the the exhibtion.

Again we desire to express the appreciation of the Association to the Supply Men for the entertainment of the first

evening, and for the everyday luncheons by courtesy of that organization.

To the Pierce-Arrow Motor Car Company of Buffalo through Colonel Clifton, Chairman of the Board of Directors, we extend expressions of marked appreciation on account of that company through Colonel Clifton having offered the services of a fleet of five-ton Pierce-Arrow trucks without cost to haul exhibits from East Aurora, sixteen miles from Buffalo, that might on account of embargo be prevented from reaching sidings in the City of Buffalo, an evidence of the big-heartedness of the Pierce-Arrow Company and its desire to have Buffalo known as a city where no achievement is impossible. In this connection we also express appreciation to Mr. B. C. Oliphant, President of the Iroquois Natural Gas Company for that company's offer of its two five-ton Pierce-Arrow trucks to accomplish the same service offered by the Pierce-Arrow Company.

We desire the Iroquois Natural Gas Company to feel that this Association heartily appreciates the many courtesies extended by that company to the Association and its members during their stay in Buffalo, and to others who have through their thoughtfulness and courtesy smoothed the way of those directing the Convention and Exhibition matters, and who in one form or another have aided materially in making the present meeting an exceedingly notable one in the career of this organization.

(Signed) LUCIUS S. BIGELOW,
F. C. HAMILTON,
R. C. JONES,
Committee on Final Resolutions.

PRESIDENT HOOVER: Gentlemen, if there are no objections and no further action, the report on Final Resolutions will be received, filed and spread upon the minutes. Mr. Oliphant I believe, wants to heard for a moment.

MR. OLIPHANT: Gentlemen, before adjourning I wish to announce that the Reading Iron Company desires to show some pictures immediately after adjournment, so bear in mind

please, all who wish to see them should remain for they will be shown immediately after we adjourn.

President Hoover: Before adjourning I think it would be proper to ask those present — and I am sorry there are not more, to express to Mr. Oliphant, as our Retiring President, our great appreciation for the wonderful Convention we have had in Buffalo and to Secretary Way, who does not retire, an expression of like appreciation.

It was then moved by Mr. Francis P. Fisher, duly seconded by Mr. Roswell H. Johnson and unanimously carried by a rising vote, that a hearty expression of thanks and of appreciation be accorded to the Retiring President, Mr. Oliphant, and to the Secretary, Mr. Way, for services rendered to the Association in bringing to a successful conclusion the meeting just ending.

President Hoover: If there is no further business a motion to adjourn is in order.

And thereupon, on motion of Mr. Roswell H. Johnson, duly seconded by Mr. W. H. McKenzie and carried, the Fifteenth Annual Meeting of the Natural Gas Association of America adjourned *sine die*.

APPENDIX

OFFICERS

OF THE

NATURAL GAS ASSOCIATION OF AMERICA 1921

PRESIDENT

H. J. HOOVER.............................Cincinnati, Ohio.

VICE PRESIDENTS

L. B. DENNING....................Pittsburgh, Pennsylvania
O. K. SHANNON........................Fort Worth, Texas
H. A. QUAY........................Pittsburgh, Pennsylvania

SECRETARY AND TREASURER

WM. B. WAY........................Pittsburgh, Pennsylvania

DIRECTORS

C. W. SEARS, Cleveland, Ohio............. Term Expires 1921
G. F. BATCHELOR, Pittsburgh, Pa. .... Term Expires 1921
L. S. HORNOR, Clarksburg, W. Va. .... Term Expires 1921
F. F. SCHAUER, Pittsburgh, Pa. .... Term Expires 1921
WM. MOELLER, Taft, California........... Term Expires 1921
J. W. MCMAHON, Toledo, Ohio............ Term Expires 1921
T. O. SULLIVAN, Pittsburgh, Pa. .... Term Expires 1922
J. J. MCMAHON, Cleveland, Ohio......... Term Expires 1922
FREEMAN T. EAGLESON, Columbus, Ohio... Term Expires 1922
R. G. ALTIZER, Charleston, W. Va. .... Term Expires 1922
ALFRED HURLBURT, Pittsburgh, Pa. .... Term Expires 1922
J. D. CREVELING, New York, N. Y. .... Term Expires 1922

PAST PRESIDENTS

KERR M. MITCHELL (Deceased)	1906–1907
JESSE C. MCDOWELL	1908–1909
WILLIAM H. MCKENZIE	1910
JOHN M. GARARD	1911
ALEXANDER B. MACBETH	1912
MARTIN B. DALY	1913
ERNEST L. BRUNDRETT	1914
JAMES T. LYNN	1915
WILLIAM Y. CARTWRIGHT	1916
JOSEPH F. GUFFEY	1917–1918
KAY C. KRICK	1919
B. C. OLIPHANT	1920

PAST SECRETARIES

JOSEPH H. DUNKEL	1906–1908
JAMES F. OWENS (Elected for)	1909
THOMAS C. JONES	1910–1918
DAVID O. HOLBROOK (Deceased)	1918–1919

PAST ANNUAL MEETINGS

Organization — Kansas City, Mo., February 20, February 27 and March 20, 1906.

First	Kansas City, Mo., June 12 and 13, 1906
Second	Joplin, Mo., May 21, 22 and 23, 1907
Third	Kansas City, Mo., May 19, 20 and 21, 1908
Fourth	Columbus, Ohio, May 18, 19 and 20, 1909
Fifth	Oklahoma City, Okla., May 17, 18 and 19, 1910
Sixth	Pittsburgh, Pa., May 16, 17 and 18, 1911
Seventh	Kansas City, Mo., May 21, 22 and 23, 1912
Eighth	Cleveland, Ohio, May 20, 21 and 22, 1913
Ninth	St. Louis, Mo., May 19, 20 and 21, 1914
Tenth	Cincinnati, Ohio, May 18, 19 and 20, 1915
Eleventh	Pittsburgh, Pa., May 16, 17 and 18, 1916
Twelfth	Buffalo, N. Y., May 15, 16 and 17, 1917
Thirteenth	Pittsburgh, Pa., May 22 and 23, 1918
Fourteenth	Cleveland, Ohio, May 20, 21 and 22, 1919
Fifteenth	Buffalo, N. Y., May 18, 19 and 20, 1920

COMMITTEES — 1920-1921

ADVISORY

B. C. Oliphant	Buffalo, N. Y.
Kay C. Krick	Columbus, Ohio
Joseph F. Guffey	Pittsburgh, Pennsylvania
W. Y. Cartwright	Cincinnati, Ohio
J. T. Lynn	Detroit, Michigan
Ernest L. Brundrett	Kansas City, Missouri
Martin B. Daly	Cleveland, Ohio
A. B. Macbeth	Los Angeles, California
John M. Garard	Columbus, Ohio
W. H. McKenzie	Kansas City, Missouri
J. C. McDowell	Pittsburgh, Pennsylvania

UNIFORM ACCOUNTING

George W. Ratcliffe, *Chairman*	Pittsburgh, Pennsylvania
R. H. Bartlett	Tulsa, Oklahoma
W. R. Hadley	Pittsburgh, Pennsylvania
C. W. Downing	Cleveland, Ohio
W. J. Judge	New York, New York
J. B. Tonkin	Pittsburgh, Pennsylvania
C. S. Mitchell	Pittsburgh, Pennsylvania
T. F. Wickham	Cincinnati, Ohio
C. H. Jay	Columbus, Ohio
L. A. Seyffert	Charleston, West Virginia
A. J. Newman	Pittsburgh, Pennsylvania
J. B. Wikoff	Pittsburgh, Pennsylvania
W. B. S. Winans	60 Wall Street, New York
Wm. B. Way	Pittsburgh, Pennsylvania

CONSERVATION

J. B. Corrin, *Chairman*	Pittsburgh, Pennsylvania
J. H. Maxon	Muncie, Indiana.
A. J. Diescher	New York City
Ira L. Neely	Wooster, Ohio
Alfred Hurlburt	Pittsburgh, Pennsylvania
Wm. B. Way	Pittsburgh, Pennsylvania

JOINT COMMITTEE ON ELECTROLYSIS

F. M. Towl........................ New York, New York
T. R. Weymouth.................. Oil City, Pennsylvania
S. S. Wyer........................ Columbus, Ohio

UNITED STATES BUREAU OF STANDARDS

Representatives

B. C. Oliphant.................. Buffalo, New York
H. C. Cooper..................... Pittsburgh, Pennsylvania

COMMITTEE ON AWARDS FOR WRINKLE DEPARTMENT

F. W. Stone...................... Ashtabula, Ohio
John B. Corrin.................. Pittsburgh, Pennsylvania
Frank H. Crawford............. Columbus, Ohio
Wm. B. Way...................... Pittsburgh, Pennsylvania

WRINKLE DEPARTMENT

W. Re. Brown, *Editor*............ Columbus, Ohio

MEMBERSHIP COMMITTEE

O. K. Shannon, *Chairman*......... Fort Worth, Texas
H. S. Norris...................... Buffalo, New York
Lynn S. Hornor.................. Clarksburg, West Virginia
Wm. B. Way...................... Pittsburgh, Pennsylvania

FINANCE COMMITTEE

Leslie B. Denning, *Chairman*...... Pittsburgh, Pennsylvania
T. O. Sullivan.................. Pittsburgh, Pennsylvania
H. A. Quay...................... Pittsburgh, Pennsylvania

PUBLICITY COMMITTEE

R. G. ALTIZER, *Chairman*	Charleston, West Virginia
LARMOUR ADAMS	Erie, Pennsylvania
J. B. TONKIN	Pittsburgh, Pennsylvania
J. D. CREVELING	New York City
GEO. W. RATCLIFFE	Pittsburgh, Pennsylvania
JNO. B. CORRIN	Pittsburgh, Pennsylvania
ALFRED HURLBURT	Pittsburgh, Pennsylvania
C. W. SEARS	Cleveland, Ohio
WM. B. WAY	Pittsburgh, Pennsylvania

DIRECTORY OF MEMBERSHIP

(The date with each name is that of election to membership.)

HONORARY MEMBERS

Bailey, Edgar H. S. .... May 19, 1908
Professor of Chemistry, University of Kansas, 1101 Ohio Street, Lawrence, Kansas.

Bownocker, John Adams .... May 18, 1909
State Geologist of Ohio, Ohio State University, 185 Fifteenth Avenue, Columbus, Ohio.

Gould, Charles Newton .... May 17, 1910
Geological Engineer, 1218-19 Colcord Bldg., Oklahoma City, Oklahoma.

Harmon, Judson .... May 18, 1909
Lawyer, Cincinnati, Ohio.

Haworth, Erasmus, Ph. D. .... May 21, 1907
Professor of Geology and Mining, University of Kansas, Lawrence, Kansas.

Sears, Clifton W. .... February 27, 1906
Vice President, Empire Gas and Fuel Company, Fort Worth, Texas.

Sweetman, Michael M. .... February 27, 1906
Secretary, New York Oil and Gas Company, 316 American Bank Building, Kansas City, Missouri.

White, Israel C. .... May 16, 1911
State Geologist of West Virginia, P. O. Box 848, Morgantown, West Virginia.

ACTIVE MEMBERS

Abbott, D. E. .... May 18, 1915
Director, Huntington Development and Gas Company, 918 Sixth Avenue, Huntington, West Virginia.

Abbott, E. D. .... May 18, 1909
Manager, The Springfield Gas Company, 221 North Fountain Avenue, Springfield, Ohio.

Abell, H. C. .... May 21, 1912
Engineer, American Light and Traction Co., 120 Broadway, New York, New York.

Abt, John .... May 19, 1919
Meter Department, East Ohio Gas Company, Akron, Ohio.

Adams, C. H. .... May 15, 1917
Field Foreman, United Natural Gas Co., Kane, R. F. D. No. 2, Pennsylvania.

Adams, Larmour .... May 21, 1912
Metric Metal Works, Tenth and Payne Avenue, Erie, Pennsylvania.

Adams, W. H. .... May 16, 1916
Assistant Local Manager, The Citizens Gas and Electric Company, Lorain, Ohio.

Adams, William M. .... May 16, 1916
Agent, Citizens Gas and Electric Company, 124 North Bridge Street, Elyria, Ohio.

Alberty, P. A. .... May 15, 1917
Secretary, The Logan Natural Gas and Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Alexander, W. F. .... May 18, 1915
Natural Gas Insurance, Clarksburg, West Virginia.

Allen, J. C. .... May 14, 1920
Manager of Station, Ouachita Gas Company, Monroe, Louisiana.

Allen, Leon L. .... April 17, 1919
Field Superintendent, Berea Pipe Line Company, Berea, Ohio.

Allen, S. S., Jr. .... May 21, 1907
Assistant Secretary, Columbus Gas and Fuel Company, 135 North Front Street, Columbus, Ohio.

Allison, James W. .... April 17, 1919
Chief Engineer, Randall Gas Company, Morgantown, West Virginia.

Aloe, Thomas .... April 23, 1919
Contractor, All Gas and Oil Companies, 443 Third Avenue, Pittsburgh, Pennsylvania.

Altizer, R. G. .... May 19, 1914
Vice President, United Fuel Gas Company, 1422 Kanawha Street, Charleston, West Virginia.

Amey, L. C. .... May 19, 1914
Chief Engineer, Manufacturers Gas Company, Kane, Pennsylvania.

Anderson, E. J. .... May 15, 1917
Superintendent, Texas Gas Company, Mexia, Texas.

Anderson, E. J. .... January 31, 1919
United Fuel Gas Company, P. O. Box 285, Huntington, West Virginia.

Anderson, J. F. .... May 16, 1916
Field Foreman, The People's Natural Gas Company, R. D. No. 1, Mayport, Pennsylvania.

Anderson, J. K. .... February 19, 1920
Consulting Engineer, Anderson and Taylor, 504-507 Coyle and Richardson Building, Charleston, West Virginia.

Anderson, Ross P. .... May 20, 1919
Chief Chemist, United Natural Gas Company, Oil City, Pennsylvania.

Angle, J. E. .... May 16, 1911
Superintendent, Fayette County Gas Company, 302 South Pittsburgh Street, Connellsville, Pennsylvania.

Apple, C. B. .... May 15, 1917
12518 Clifton Boulevard, Lakewood, Ohio.

Applegate, H. L. .... May 22, 1918
Land Agent, Carnegie Natural Gas Company, 816 Carnegie Building, Pittsburgh, Pennsylvania.

Armbruster, George E. ....May 8, 1919
Local Manager, Logan Natural Gas and Fuel Company, Logan, Ohio.

Armstrong, Andrew A. ....May 18, 1909
General Manager, Union Natural Gas Corporation, 1615 Union Bank Building, Pittsburgh, Pennsylvania.

Armstrong, Thomas ....May 15, 1917
Inspector, Iroquois Natural Gas Company, 583 West Avenue, Buffalo, New York.

Armstrong, W. A. ....May 19, 1920
Manager, Ingersoll-Rand Company, Cleveland, Ohio.

Arnold, W. H. ....May 18, 1915
Representative, Pittsburgh Valve, Foundry and Construction Company, 1817 Tonapah Avenue, Pittsburgh, Pennsylvania.

Arras, Walter H. ....May 16, 1916
Chief Clerk, Purchasing Department, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Ashby, Guy ....May 19, 1919
Clerk, Hope Natural Gas Company, Alum Bridge, West Virginia.

Ashdown, F. J. ....May 19, 1920
Foreman, East Ohio Gas Company, 42 Liberty Street, East Palestine, Ohio.

Ashenhart, John F ....April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Route No. 4, Fairview, West Virginia.

Ashley, Walter A. ....May 16, 1916
Local Superintendent, Logan Natural Gas and Fuel Company, Chillicothe, Ohio.

Ashton, H. T. ....May 18, 1915
Assistant Engineer, Ohio Cities Gas Company, Tulsa, Oklahoma.

Assur, Samuel ....February 18, 1920
Vice President, Cincinnati Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio

Ayer, J. W. ....May 19, 1914
Sales Manager, Reznor Manufacturing Company, Reznor Street, Mercer, Pennsylvania.

Bachus, Ray E. ....March 21, 1919
Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Baehr, William Alfred ....May 21, 1912
Consulting Engineer, 2013 Peoples Gas Building, Chicago, Illinois.

Bahan, J. P. ....May 15, 1917
Clerk, The Texas Company, Natural Gas Department, 1708 Fairfield Avenue, Shreveport, Louisiana.

Bair, Charles E. ....May 18, 1920
1312 Fulton Building, Pittsburgh, Pennsylvania.

Baird, George H. ....May 17, 1920
Assistant Superintendent of Department of Gas Measurement, Empire Gas and Fuel Company, Drawer F, Bartlesville, Oklahoma.

Baird, O. H. ....March 27, 1919
Pennsylvania Gas Company, Ludlow, Pennsylvania.

Balcom, E. A. .... May 17, 1920
Field Foreman, Medina Gas Company, Vienna, Ontario, Canada.

Ballard, Charles R. .... May 18, 1909
Manufacturer, Ballard Patent Suction and Discharge Valves, Midway, Pennsylvania.

Ballard, H. O. .... May 19, 1914
Superintendent of Production, Wichita Natural Gas Company, 605 East Third Street, Bartlesville, Oklahoma.

Barger, Louis F. .... May 20, 1913
General Superintendent, Peoples Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Barbour, F. P. .... May 18, 1920
Right of Way Department, Hope Natural Gas Company, Empire Bank Building, Clarksburg, West Virginia.

Barker, W. J. .... May 19, 1919
Foreman, Hope Natural Gas Company, Hastings, West Virginia.

Barnard Frank B. .... May 18, 1920
1110 Prudential Bldg., Buffalo, N. Y.

Barnes, R. B. .... May 16, 1911
District Superintendent, United Natural Gas Company, Mill Street, Brookville, Pennsylvania.

Barnsdall, T. N. .... May 19, 1914
Manager and Treasurer, The Highland Gas Company, 146 West Washington Street, Bradford, Pa.

Barr, James H. .... May 18, 1915
President, The National Supply Company, Pittsburgh, Pennsylvania, and Toledo, Ohio.

Barrett, M. F. .... May 19 ,1914
President, The Cleveland Brass Manufacturing Company, 4606-26 Hamilton Avenue, Cleveland, Ohio.

Barrows, George S. .... May 16, 1916
Manager Gas Heating Department, General Fire Extinguisher Company, 275 West Exchange Place, Providence, Rhode Island.

Barrows, L. E. .... May 18, 1915
The Texas Company, Drawer 1805, Houston, Texas.

Barry, R. N. .... May 20, 1919
Contractor, Caledonia, Ontario, Canada.

Bartlett, E. O. .... May 16, 1911
Secretary-Treasurer, Texas Gas Company, 21 East Fortieth Street, New York, New York.

Bartlett, John C. .... May 16, 1916
Secretary and Treasurer, Oklahoma Natural Gas Company, Caney River Gas Company, Enid Natural Gas Company, Assistant Secretary and Treasurer, Osage & Oklahoma Company, 1402 Union Bank Bldg., Pittsburgh, Pennsylvania.

Bartlett, R. H. .... May 16, 1911
Assistant to the President, Oklahoma Natural Gas Company, 117 West Fourth Street, Tulsa, Oklahoma.

Bartley, E. L. .... May 18, 1909
Iroquois Apartments, Pittsburgh, Pennsylvania.

Bartow, A. T. .... May 18, 1915
Central Indiana Gas Company, Marion, Indiana.

Bass, W. H. .... May 15, 1917
Foreman, Alden-Batavia Natural Gas Company, Alden, New York.

Batchelor, E. E...........May 7, 1920
Auditor, The Natural Gas Company of West Virginia, 323 Fourth Avenue, Pittsburgh, Pennsylvania.

Batchelor, G. F...........May 19, 1914
President, The Natural Gas Company of West Virginia, 323 Fourth Avenue, Pittsburgh, Pennsylvania.

Batdorf, E. D...........May 22, 1918
Cashier, The Dayton Gas Company, First and St. Clair Streets, Dayton, Ohio.

Battin, Henry S...........May 21, 1912
Assistant General Superintendent, United Gas Improvement Company, Broad and Arch Streets, Philadelphia, Pennsylvania.

Bauer, C. J...........May 15, 1917
Purchasing Agent, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Bauer, W. T...........May 17, 1920
Accountant, F. C. Hamilton, Sixty Wall Street, New York City.

Baxter, G. J...........May 6, 1919
Chief Engineer, Ohio Fuel Supply Co., R. R. No. 2, Box 45, Ashland, Ohio.

Baxter, J. F...........May 20, 1919
Hope Natural Gas Company, Parkersburg, West Virginia.

Bay, B. R...........May 15, 1917
Chief Engineer, The Medina Gas & Fuel Company, 139 Dickson Avenue, Mansfield, Ohio.

Beach, Ralph A...........May 16, 1916
Assistant to Superintendent T. W. Phillips, Gas and Oil Company, 120 East Cunningham Street, Butler, Pennsylvania.

Beam, Charles..........May 18, 1920
Dominion Natural Gas Co., Dunnville, Ontario, Canada.

Beardsley, R. D...........May 16, 1916
Treasurer, The Reserve Gas Company, The Hope Natural Gas Company, The Peoples Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Beatty, Elmer C...........May 16, 1916
Foreman, Manufacturers Gas Company, 65 West Corydon Street, Bradford, Pennsylvania.

Becker, J. A...........May 19, 1920
Vice President and General Manager, The Cree-Becker Oil Tool Company, Box 908, Newark, Ohio.

Bedford, A. C...........May 16, 1916
Chairman of Board, Standard Oil Company, of New Jersey, 26 Broadway, New York, New York.

Baers, P. C...........May 20, 1919
Director, Manufacturers Light and Heat Company, Henry I. Beers' Building, Oil City, Pennsylvania.

Bell, Charles D...........May 21, 1907
Assistant Superintendent, Southern California Gas Company, 1311 Albany Street, Los Angeles, California.

Benkert, Fred A...........May 8, 1920
Field Clerk, Peoples Natural Gas Company, R. R. No. 1, Mayport, Pennsylvania.

Benner, George K.....................................May 16, 1916
President, Benner Tool Company, 6431-6433 Penn Avenue, East End, Pittsburgh, Pennsylvania.

Bennett, H. L....April 21, 1919
Superintendent, West Virginia Central Gas Company, Parsons, West Virginia.

Benninger, A. J...May 20, 1919
McCoy Natural Gas Company, Knox, Pennsylvania.

Benninger, N. H...May 15, 1917
Superintendent, United Natural Gas Company, Station R, South Oil City, Pennsylvania.

Benninger, R. E...May 15, 1917
Chief Engineer, United Natural Gas Company, Hallton, Pennsylvania.

Benson, L. B....May 22, 1918
Assistant Superintendent Distribution, Empire Gas and Pipe Line Company, Bartlesville, Oklahoma.

Bentley, H. G...May 15, 1920
Manager, Kane Supply Company, 17 Greens Street, Kane, Pennsylvania.

Berg, C. O....May 15, 1917
Foreman, United Natural Gas Company, Mabel Street, Reynoldsville, Pennsylvania.

Berry, B. N...May 15, 1917
Contractor, Dominion Natural Gas Company, Caledonia, Ontario.

Berwald, P. M...May 18, 1915
General Manager, Pure Gasoline Company, 92 Main Street, Bradford, Pennsylvania.

Bettcher, W. F....May 18, 1920
East Ohio Gas Company, 1032 Lake View Road, Cleveland, Ohio.

Bevan, R. L...May 18, 1915
Assistant Tresurer, Calgary Gas Company, Limited, 215 Sixth Avenue, West, Calgary, Alberta, Canada.

Biddison, P. McDonald...................................May 21, 1907
407 Chittenden Avenue, Columbus, Ohio.

Bieler, O...May 15, 1917
Salesman, Westinghouse Electric and Manufacturing Company, 1808 Union Bank Building, Pittsburgh, Pennsylvania.

Bigelow, Lucius S.......................................May 21, 1907
President-Editor, Periodicals Publishing Company, Littell Building, 68 West Huron Street, Buffalo, New York.

Bigger, A. G....April 30, 1919
Union Natural Gas Corporation, Union Bank Building, Pittsburgh, Pennsylvania.

Bigger, J. C....May 13, 1919
Care of Guffey-Gillespie Company, Union Bank Building, Pittsburgh, Pennsylvania.

Bigler, G. K....May 20, 1913
City Plant Foreman, United Natural Gas Company, Franklin, Pennsylvania.

Billingsley, J. E. .... May 16, 1916
Care of Guffey-Gillespie Company, Union Bank Building, Pittsburgh, Pennsylvania.

Bishop, H. W., Jr. .... May 18, 1909
Representative, LaBelle Iron Works, Steubenville, Ohio.

Black, C. H. .... May 20, 1919
District Sales Manager, Black Steel and Wire Company, 207 Cosden Building, Tulsa, Oklahoma.

Black, J. J. .... May 17, 1920
Field Foreman, United Natural Gas Company, Hallton, Elk County, Pennsylvania.

Blackburn, H. W. .... May 20, 1919
Engineer, Empire Gas and Fuel Company, Mansfield, Ohio.

Blackburn, Oscar .... February 18, 1920
Teller, Union Gas and Electric Company, 7036 Fern Bank Avenue, Cincinnati, Ohio.

Blair, J. A. .... May 22, 1918
Traveling Salesman, Waterbury Company, 63 Park Row, New York, New York.

Blair, J. B. .... May 20, 1919
Operator (Independent), Chittenango, New York.

Blake, B. F. .... May 15, 1917
Chief Engineer, Treat Comressing Station, The Ohio Fuel Supply Company, Homer, Ohio.

Blank, George W. .... April 26, 1919
Agent, The Manufacturers Light and Heat Company, Beaver Falls, Pennsylvania.

Blauvelt, Warren S. .... May 15, 1917
President, Indiana Coke and Gas Company, Terre Haute, Indiana.

Blommers, Pierre .... April 22, 1919
Sales Manager, Ross Mechanical Supply Company, 2 Ross Street, Pittsburgh, Pennsylvania.

Blue, Burdette .... May 20, 1919
Counsel, Indian Territory Illuminting Oil Company, Masonic Building, Bartlesville, Oklahoma.

Blum, William .... May 16, 1916
Superintendent, Sugar Grove Field, Logan Natural Gas and Fuel Company, Lancaster, Ohio.

Bockmier, Fred J. .... May 19, 1920
Foreman, Portland Lumber Company, Ridgway, Pennsylvania.

Bodine, Samuel Taylor .... May 17, 1910
President, The United Gas Improvement Company, Broad and Arch Streets, Philadelphia, Pennsylvania.

Boggs, G. R. .... April 26, 1920
Bookkeeper, Newark Natural Gas and Fuel Company, 58 West Main Street, Newark, Ohio.

Bonnell, E. E. .... May 11, 1920
Foreman, Logan Gas Company, 29 South Washington Street, Tiffin, Ohio.

Bonnell, James F. .... March 4, 1919
Oil Well Supply Company, 107 South Main Street, Winchester, Kentucky.

Bonner, J. W.....................May 19, 1919
Assistant Foreman, Hope Natural Gas Company, Wallace, West Virginia.

Bonnett, Frank....................May 7, 1920
Engineer, The Natural Gas Company of West Virginia, 34 Garfield Avenue, Salem, Ohio.

Boocks, C. W.....................May 16, 1916
District Foreman, Hope Natural Gas Company, Hastings, West Virginia.

Booth, Arthur....................May 17, 1910
President, Pittsburgh Supply Company, 242-244 First Avenue, Pittsburgh, Pennsylvania.

Booth, W. F.....................May 20, 1913
Manager, Little Rock Gas and Fuel Company, 624 Louisiana Street, Little Rock, Arkansas.

Borradaile, H. J.....................May 20, 1919
Local Manager, Logan Natural Gas Company, Plymouth, Ohio.

Botkin, J. H.....................May 20, 1919
Accountant, Medina Gas and Fuel Company, Wooster, Ohio.

Bovaird, George W.....................May 22, 1918
Bovaird and Company, 32 Sanford Street, Bradford, Pennsylvania.

Bovard, R. C.....................April 24, 1919
Foreman, Equitable Gas Company, West Elizabeth, Pennsylvania.

Boyd, A. E.....................May 21, 1919
Assistant General Superintendent, Ohio Fuel Supply Company, Ashland, Ohio.

Boyle, E. R.....................May 15, 1917
Manager, Oil City Derrick, 7 Center Street, Oil City, Pa.

Boyles, Charles B.....................May 20, 1919
Foreman, Waynesburg Home Gas Company, Waynesburg, Pennsylvania.

Braden, Glenn T.....................May 17, 1910
President, Oklahoma Natural Gas Co., 214 Pioneer Building, Tulsa, Oklahoma.

Braden, H. W.....................May 18, 1915
Superintendent, Dominion Natural Gas Company, Limited, 807 Bank of Hamilton, Hamilton, Ontario, Canada.

Bradford, Floyd J.....................May 19, 1914
President and General Manager, Bradford Rig and Reel Company, 806 Daniels Building, Tulsa, Oklahoma.

Bradley, Gore T.....................April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Littleton, West Virginia.

Bradley, Harry....................May 20, 1913
President, Empire Gas and Fuel Company, Ltd., 78 North Main Street, Wellsville, New York.

Bradley, J. A.....................April 24, 1919
Foreman, Equitable Gas Company, 3303 Iowa Street, Pittsburgh, Pennsylvania.

Bradley, J. B.....................May 18, 1915
Secretary and Treasurer, Hornell Gas Light Company, 96 Main Street, Hornell, New York.

Bragdon, Howard K.......................................May 15, 1917
Care of Guffey-Gillespie Company, 1203 Union Bank Building, Pittsburgh, Pennsylvania.

Braun, C. J., Jr...May 16, 1911
Treasurer, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Brazier, John B...May 18, 1915
Vice President and General Manager, Powhatan Brass and Iron Works, North Mildred Street and Belt Line Avenue, Ranson, Jefferson County, West Virginia.

Breedlove, Frank..April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, 303 Thayer Street, Grafton, West Virginia.

Brend, Herbert..May 18, 1920
Cashier, Dominion Natural Gas Company, Ltd., 39 Queen Street, East; Galt, Ontario, Canada.

Brewster, Frank M........................................May 18, 1920
Assistant Foreman, Hope Natural Gas Company, 217 Center Avenue, Weston, West Virginia.

Brewster, Henry...May 16, 1916
Foreman, Hope Natural Gas Company, Weston, West Virginia.

Bridges, James M...May 17, 1920
Agent, United Natural Gas Company, Liberty Avenue, Franklin, Pennsylvania.

Brigel, Samuel G....May 16, 1920
Manager, Economy Burner and Engineering Company, 29th Street and A. V. R. R., Pittsburgh, Pennsylvania.

Briggs, Henry D...May 21, 1919
Secretary, Stovall Drilling Company, Monroe, Louisiana.

Brinham, A. L...May 15, 1917
Clerk, Union Natural Gas Corporation, 1929 Forbes Street, Pittsburgh, Pennsylvania.

Brink, George R...May 18, 1909
Care of Barnsdall Oil Company, Bartlesville, Oklahoma.

Brink, R. W...May 16, 1916
Treasurer, East Ohio Gas Company, Cleveland, Ohio.

Brock, C. E...May 22, 1918
Assistant Superintendent Gas Pipe Line, Empire Gas and Pipe Lines Company, Bartlesville, Oklahoma.

Broder, William J...May 18, 1909
Commonwealth Petroleum Corporation, 120 Broadway—Room 1642—New York, New York.

Bronson, P. J....April 12, 1920
Chief Engineer, Tonkin Compressing Station, Northwestern Ohio Natural Gas Company, Van Buren, Ohio.

Brooks, R. A....May 15, 1917
The Empire Gas and Fuel Company, Burton Building, Fort Worth, Texas.

Brown, A. L...May 22, 1918
Logan Natural Gas and Fuel Company, Columbus, Ohio.

Brown, Cameron..May 20, 1919
Manager, General Gas Light Company, 214 Wood Street, Pittsburgh, Pennsylvania.

Brown, D. J.....................May 18, 1909
Treasurer, Oil Well Supply Company, 213 Water Street, Pittsburgh, Pennsylvania.

Brown, E. R.....................May 16, 1911
General Manager, Lone Star Gas Company, Dallas, Texas.

Brown, F. A.....................May 20, 1919
East Ohio Gas Company, Canton, Ohio.

Brown, J. S.....................May 19, 1919
Well Foreman, Hope Natural Gas Company, Smithfield, West Virginia.

Brown, L. E. H.....................May 15, 1917
Field Superintendent, Potter Gas Company, Roulette, Pennsylvania.

Brown, Leigh A.....................May 15, 1917
Chief Engineer, Iroquois Natural Gas Company, Buffalo, New York.

Brown, Louis....................May 19, 1914
President, Oil Well Supply Company, 215 Water Street, Pittsburgh, Pennsylvania.

Brown, W. Re....................May 18, 1915
New Business Manager, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Browne, R. T., Jr.....................May 7, 1920
Salesman, Youngstown Sheet and Tube Company, 1626 Oliver Building, Pittsburgh, Pennsylvania.

Bruce, Robert L.....................December 22, 1919
Assistant Superintendent, E. M. Treat and Company, Box 262, Strawn, Texas.

Bruce, W. W.....................May 21, 1912
Superintendent, Oklahoma Fuel Supply Company, 419 East Eleventh Street, Chandler, Oklahoma.

Bruckner, O. L.....................May 15, 1917
Agent, The Logan Natural Gas and Fuel Company, 12 East College Avenue, Westerville, Ohio.

Brummage, P. H.....................May 18, 1920
Hope Natural Gas Company, 415 Franklin Street, Mannington, West Virginia.

Brundage, B. M.....................May 17, 1920
Agent, The Texas Company, Baird, Texas.

Brundrett, Ernest L.....................May 21, 1907
1122 Commerce Building, Kansas Citly, Missouri.

Bruner, James K.....................May 17, 1920
Manager, Pittsburgh Branch, Macomber and Whyte Rope Company, 424 First Avenue, Pittsburgh, Pennsylvania.

Brunner, E.....................May 15, 1917
Engineer, Hope Engineering and Supply Company, Mt. Vernon, Ohio.

Bryant, C. L.....................May 18, 1915
President, The Bryant Heater and Manufacturing Company, 952 East 72nd Street, Cleveland, Ohio.

Bub, L. G.....................May 22, 1917
Chief Teller, The East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Buchanan, James I. .... May 16, 1916
President, Taylorstown Natural Gas Company, Terminal Office Building, Pittsburgh, Pennsylvania.

Buel, David .... May 19, 1920
General Manager, Stitt Ignition Company, 16 East First Avenue, Columbus, Ohio.

Bullock, Charles L. .... February 27, 1906
Superintendent Distribution, Empire Gas and Fuel Company, Bartlesville, Oklahoma.

Bullock, George .... May 15, 1917
Empire Gas and Fuel Company, Bartlesville, Oklahoma.

Burford, Ira S. .... May 16, 1916
Agent, United Fuel Gas Company, Inc., 114 North Third Street, Ironton, Ohio.

Burgess, Ross .... May 18, 1920
District Foreman, Carnegie Natural Gas Company, Folsom, West Virginia.

Burkhalter, R. J. .... May 20, 1913
Assistant Secretary and Treasurer, The Northwestern Ohio Natural Gas Company, 210-213 Huron Street, Toledo, Ohio.

Burnett, Jerome B. .... May 15, 1917
404 East Twelfth Avenue, Winfield, Kansas.

Burnham, C. H. M. .... April 1, 1919
Assistant Construction Engineer, Ohio Fuel Supply Company, 99 N. Front Street, Columbus, Ohio.

Burns, E. G. .... May 18, 1915
Land Agent, Columbia Gas and Electric Company, 916 Tenth Street, P. O. Box 306, Huntington, West Virginia.

Burns, T. P. .... May 16, 1916
Shop Foreman, Hope Natural Gas Company, 1212 Juliana Street, Parkersburg, West Virginia.

Burnside, S. E. W. .... May 16, 1916
Attorney, Hope Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Burr, R. B. .... May 20, 1913
Industrial Engineer, The Logan Natural Gas and Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Burrell, George A. .... May 20, 1913
President, The Island Refining Company, 62 West Cedar Street, New York, New York.

Burson, Frank .... April 26, 1919
Field Foreman, The Manufacturers Light and Heat Company, Hundred, West Virginia.

Burtner, James C. .... May 16, 1916
Superintendent, Drilling Department, Medina Gas and Fuel Company, East Liberty Street, Wooster, Ohio.

Burwell, Anson C. .... May 19, 1920
Designing Engineer, United Natural Gas Company, 308 Seneca Street, Oil City, Pennsylvania.

Butler, J. D. .... May 21, 1919
President, Buckeye Plumbing Company, Monroe, Louisiana.

Cabot, Godfrey L. .... May 19, 1914
Proprietor, Plant at Cabot, Pennsylvania, 940 Old South Building, Boston, Massachusetts.

Cain, E. L. .... March 4, 1920
Foreman, The East Ohio Gas Company, Orrville, Ohio.

Cain, W. J. .... May 15, 1917
Division Foreman, East Ohio Gas Company, Canton, Ohio.

Callanan, J. T. .... May 18, 1915
President and Treasurer, Parkersburg Machine Company, 505 Juliana Street, Parkersburg, West Virginia.

Caldwell, C. H. .... May 8, 1920
Secretary-Treasurer, Indian Territory Illuminating Oil Company, Osage-Producers Gas Company, Drawer "L", Bartlesville, Oklahoma.

Cameron, William A. .... April 26, 1919
Traveling Auditor, Union Natural Gas Corporation of Pittsburgh, 40 Ruggery Building, Columbus, Ohio.

Campbell, J. P. .... May 16, 1916
Foreman, Hope Natural Gas Company, Lumberport, West Virginia.

Campbell, Joseph .... May 16, 1916
Agent, The Manufacturers' Light and Heat Company, 30 North Mill Street, New Castle, Pennsylvania.

Campbell, M. L. .... May 16, 1916
Pittsburgh and West Virginia Gas Company, Salem, West Virginia.

Cantrell, C. C. .... May 17, 1910
Gasoline Engineer, 230 Clayton Building, Sapulpa, Oklahoma.

Cappeau, J. P., Jr. .... May 16, 1911
Benedum-Trees Building, Pittsburgh, Pennsylvania.

Carey, W. C. .... May 15, 1917
Foreman Meter Repairs, Iroquois Natural Gas Company, 37 Ada Place, Buffalo, New York.

Carl, L. F. .... May 15, 1917
Agent, The Newark Natural Gas and Fuel Company, 58 West Main Street, Newark, Ohio.

Carleton, John .... April 24, 1919
Foreman, Equitable Gas Company, 3056 Glenmawr Avenue, Pittsburgh, Pennsylvania.

Carmody, M. B. .... May 18, 1909
Field Manager, Southwestern Gas and Electric Company, 1754 Irving Place, Shreveport, Louisiana.

Carpenter, Everett .... May 19, 1914
Chief Geologist, Continental Oil and Gas Company, Bartlesville, Oklahoma.

Carpenter, George R. .... May 16, 1916
Superintendent, United Fuel Gas Company, 1207 Elmwood Ave., Charleston, West Virginia.

Carson, W. B. .... May 16, 1911
Secretary, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Carter, O. M. .... May 16, 1916
President, United Gas Iron Company, 528 Peoples Gas Building, Chicago, Illinois.

Cartwright, William Y. .... May 21, 1912
Vice President, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Carver, W. A. .... May 20, 1919
Philadelphia Company, Pittsburgh, Pennsylvania.

Cassel, Howard N. .... May 20, 1913
Secretary-Treasurer and General Manager, LeFlore County Gas and Electric Company, Poteau, Oklahoma.

Casto, A. T. .... May 16, 1916
Superintendent, Randall Gas Company, 190 Chancery Row, Morgantown, West Virginia.

Cavenagh, Frank .... May 17, 1910
Treasurer and Sales Manager, The Westcott Jewell Company, Seneca Falls, New York.

Chadwick, J. W. .... April 21, 1919
General Manager, LeFlore County Gas and Electric Company, Fort Smith, Arkansas.

Chandler, L. F. .... May 18, 1915
Superintendent, Santa Maria Gas and Power Company, 203 West Main Street, Santa Maria, California.

Chaplin, William C. .... May 17, 1910
Treasurer, The Chaplin-Fulton Manufacturing Company, 34 Penn Avenue, Pittsburgh, Pennsylvania.

Chapman, W. B. .... May 16, 1916
Oil Producer, 74 Vandergrift Building, Pittsburgh, Pennsylvania.

Chamberlain, F. A. ....
General Manager, The Richland Public Service Company, Mansfield, Ohio.

Chase, Frank L. .... May 22, 1918
Lone Star Gas Company, Dallas, Texas.

Chenoweth, John P. .... May 20, 1919
Agent, United Fuel Gas Company, Charleston, West Virginia.

Childers, J. .... May 20, 1919
The East Ohio Gas Company, Danville, Ohio.

Chisler, Joseph Clark .... February 26, 1919
Assistant Treasurer, Hope Natural Gas Company, Reserve Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Chuck, Joseph E. .... February 18, 1920
Clerk, Columbia Gas and Electric Company, 21 East 77th Street, Carthage, Cincinnati, Ohio.

Clagett, E. F. .... May 18, 1915
Engineer, The Columbus Gas and Fuel Company, 135 North Front Street, Columbus, Ohio.

Clark, Earl A. .... May 16, 1911
Proportional and Domestic Service, Meter Testing, Tulsa, Oklahoma, Box 973.

Clark, H. L. .... April 26, 1919
Engineer in Charge, The Manufacturers Light and Heat Company, Rosbys Rocks, West Virginia.

Clark, J. S. .... May 19, 1914
Manager, Okmulgee Gas Company, 319 West Sixth Street, Okmulgee, Oklahoma.

Clark, James....................................May 19, 1914
Division Superintendent, Philadelphia Company, 17th and Wharton Streets, Pittsburgh, Pennsylvania.

Clark, Robert E.....................................May 16, 1916
Land Agent, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Clark, Walton....................................May 21, 1907
Second Vice-President, United Gas Improvement Company, Broad and Arch Streets, Philadelphia, Pa.

Clarke, Alex....................................May 19, 1919
Engineer, United Fuel Gas Company, Charleston, West Virginia.

Clarkson, R. J.....................................May 19, 1914
Division Superintendent, Philadelphia Company of West Virginia, Littleton, West Virginia.

Clay, Paul E.....................................May 19, 1920
Arkansas Natural Gas Company, Vivian, Louisiana.

Cleary, J. D.....................................May 15, 1917
Agent. Angola, New York, Iroquois Natural Gas Company, Angola, New York.

Clifford, Thomas C.....................................May 16, 1911
Sales Manager, Pittsburgh Meter Company, East Pittsburgh, Pennsylvania.

Cline, Walter B.....................................May 21, 1912
President, Los Angeles Gas and Electric Corporation, 645 South Hill Street, Los Angeles, California.

Clover, John M.....................................May 15, 1917
President, The Iron Mountain Oil Co., P. O. Box 811, Tulsa, Oklahoma.

Clover, M. K.....................................May 18, 1915
The Neely-Clover Company, St. Marys, Ohio.

Clover, S. C.....................................May 15, 1917
Oil and Gas Department, The Iron Mountain Oil Company, 409 Unity Building, Tulsa, Oklahoma.

Clowes, Charles R.....................................May 17, 1920
Salesman, Pittsburgh Gage and Supply Company, 3000 Liberty Avenue, Pittsburgh, Pennsylvania.

Cluley, C. F.....................................May 20, 1913
Agent, The East Ohio Gas Company, Millersburg, Ohio.

Cobb, D. L.....................................May 17, 1920
Secretary-Treasurer, Lone Star Gas Company, Dallas, Texas.

Cochran, Horace J.....................................May 18, 1915
President and Manager, Maysville Gas Company, Maysville, Kentucky.

Cohn, Charles M.....................................May 21, 1912
Vice President, Consolidated Gas, Electric Light and Power Company of Baltimore, 100 West Lexington Street, Baltimore, Maryland.

Cole, E. J.....................................May 16, 1911
Arkansas Natural Gas Company, P. O. Box No. 94, Shreveport, Louisiana.

Cole, W. G...May 16, 1911
Division Superintendent, Equitable Gas Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Coleman, L. G...May 19, 1914
Engineer, Henry L., Doherty and Company, 60 Wall Street, New York, New York.

Collins, Frank..May 18, 1915
Vice President, National Supply Company, Toledo, Ohio.

Colson, F. D...April 23, 1919
Secretary and Treasurer, The Commercial Oil and Gas Company, 172 Main Street, Ashtabula, Ohio.

Conan, Walter R...May 10, 1920
Superintendent Gas Division, Union Oil Company of California, Room 936 Union Oil Building, Los Angeles, California.

Connors, Eugene F...May 15, 1917
General Superintendent, Pittsburgh Oil and Gas Company, 1005 Farmers Bank Building, Pittsburgh, Pennsylvania.

Coogle, J. M...May 18, 1920
Salesman, New Martinsville Supply Co., New Martinsville, West Virginia.

Coolahan, P. J...May 15, 1917
Superintendent, Berea Pipe Line Company, 88 Furnace Street, Berea, Ohio.

Cooper, Ben S...May 7, 1920
Land Department, The Natural Gas Company of West Virginia, 323 Fourth Avenue, Pittsburgh, Pennsylvania.

Cooper, H. C...May 20, 1913
Chief Engineer, Hope Natural Gas Company, Clarksburg, West Virginia.

Corbus, C. D...May 20, 1913
Manager Welsbach Company, 429 Main Street, Cincinnati, Ohio.

Corder, Charles..May 20, 1919
Meter Reader, Hope Natural Gas Company, Miletus, West Virginia.

Cornell, J. H...May 20, 1919
Field Foreman, Hope Natural Gas Co., Newberne, West Virginia.

Cornell, J. S...May 20, 1919
Foreman, Hope Natural Gas Company, Littleton, West Virginia.

Corrin, John B...May 20, 1913
Vice President and General Manager, The Reserve Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Coste, D. A...May 15, 1917
Treasurer, Provincial Natural Gas and Fuel Company, Drawer 55, Niagara Falls, Ontario, Canada.

Coste, Dillon..May 20, 1913
Secretary, Calgary Gas Company, Ltd., 215 Sixth Avenue, Calgary, Alberta, Canada.

Coste, E. Frank..April 5, 1920
Assistant General Superintendent, The Canadian Western Natural Gas, Light, Heat and Power Company, 215 Sixth Avenue, West, Calgary, Alberta, Canada.

Coste, Eugene..........May 20, 1913
President, The Canadian Western Natural Gas, Light, Heat and Power Company, Ltd., 128 Seventh Avenue, East, Calgary, Alberta, Canada.

Couch, H. V...........May 22, 1918
Purchasing Agent, United Natural Gas Company, 308 Seneca Street, Oil City, Pennsylvania.

Courtney, D. H...........May 18, 1915
President, Randall Gas Company, 179 High Street, Morgantown, West Virginia.

Cowden, M. L...........April 26, 1919
Engineer in Charge, The Manufacturers' Light and Heat Company, Waynesburg, Pennsylvania.

Cowham, H. I...........May 21, 1912
Manager Land Department, Kasigan Oil, Gas and Power Company, 115½ East Main Street, Independence, Kansas.

Cox, Frank..........May 18, 1915
Secretary, Navajo Gas Company, Charleston, West Virginia.

Coyle, Henry..........May 18, 1909
Superintendent, Mains and Field, Logan Natural Gas and Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Crabbe, R. J...........April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Glenville, West Virginia.

Craft, Charles..........May 16, 1911
Chief Engineer, East Ohio Gas Company, West Park, Ohio.

Crahan, B. J...........May 17, 1910
General Manager, The Portsmouth Gas Company, 802 Chillicothe Street, Portsmouth, Ohio.

Craig, Albert B...........May 16, 1916
General Manager, Chartiers Oil Company, Columbia Bank Building, Pittsburgh, Pennsylvania.

Craig, W. P...........May 20, 1913
General Superintendent, United Natural Gas Company, 308 Seneca Street, Oil City, Pennsylvania.

Cratty, James M...........May 15, 1917
Foreman, Meter Department, Pennsylvania Gas Company, Jamestown, New York.

Crawford, A. A...........May 16, 1916
General Superintendent, Manufacturers' Gas Company, 43 Congress Street, Bradford, Pennsylvania.

Crawford, C. J...........May 16, 1916
1028 Liberty Street, Franklin, Pennsylvania.

Crawford, David B...........May 16, 1911
Secretary and Treasurer, Parkersburg Rig and Reel Company, 626 Marietta Avenue, Parkersburg, West Virginia.

Crawford, F. H...........May 16, 1911
Chief Engineer, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Crawford, Frederick W...........May 18, 1909
President, United Fuel Gas Company, 99 North Front Street, Columbus, Ohio.

Crawford, G. L.....................................April 24, 1919
Foreman, Philadelphia Company, Kilbuck Street, Glenfield, Pennsylvania.

Crawford, George W.....................................May 17, 1910
President, Ohio Fuel Supply Company, 2017 Farmers Bank Building, Pittsburgh, Pennsylvania.

Crawford, H. J.....................................April 23, 1919
President, Pennsylvania Fuel Supply Company, Emlenton, Pennsylvania.

Crawford, James B.....................................May 16, 1911
United Natural Gas Company, 308 Seneca Street, Oil City, Pennsylvania.

Crawford, John M.....................................May 16, 1911
President, Parkersburg Rig and Reel Company, Box 716, Parkersburg, West Virginia.

Crawford, J. W. R.....................................May 16, 1911
120 Broadway, New York, New York.

Crawford, R. A.....................................May 20, 1913
167 South Fountain Avenue, Wichita, Kansas.

Creveling, J. D.....................................May 15, 1917
Henry L. Doherty Company, 60 Wall Street, New York City, New York.

Critchfield, C. F.....................................May 16, 1916
Special Agent, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Critchfield, Charles V.....................................March 3, 1919
Domestic Coke Corporation, 1208 Engineers' Building, Cleveland, Ohio.

Cronin, John M.....................................May 18, 1915
Assistant Manager, Columbia Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Crosby, G. A.....................................May 16, 1916
Surveyor, Land Department, Potter Gas Company, 21 East 40th Street, New York City.

Cross, J. A.....................................May 19, 1919
Oil Foreman, Hope Natural Gas Co., Fairview, R. F. D. No. 1, West Virginia.

Cross, J. C.....................................May 19, 1919
Bookkeeper, Hope Natural Gas Company, Hastings, West Virginia.

Cross, Raymond....................................May 16, 1911
President, United Natural Gas Company, 308 Seneca Street, Oil City, Pennsylvania.

Crossett, John....................................May 16, 1911
Division Superintendent, Philadelphia Company, Arch Street, Kittanning, Pennsylvania.

Crouse, George C.....................................May 18, 1920
Abstractor, Hope Natural Gas Company, West Union, West Virginia.

Crowe, E. L.....................................May 17, 1920
Engineer, The Koppers Company, Union Arcade, Pittsburgh, Pennsylvania.

Crowe, R. R. .... May 21, 1919
United Natural Gas Company, Bradford, Pennsylvania.

Crowl, P. E. .... May 15, 1917
Agent, Potter Gas Company, Galeton, Pennsylvania.

Crowther, J. G. .... May 20, 1919
Erecting Engineer, Hope Natural Gas Company, Clarksburg, West Virginia.

Cruger, Arthur S. .... February 4, 1919
Stock Records, Calgary Gas Company, Ltd., 215 Sixth Avenue, West; Calgary, Alberta, Canada.

Crum, M. C. .... May 16, 1916
Agent, The People's Natural Gas Company, Monessen, Pennsylvania.

Crutcher, W. H. .... September 9, 1918
Gas Superintendent, Oklahoma Gas and Electric Company, Oklahoma City, Oklahoma.

Cude, H. E. .... May 17, 1920
Chemist, Manufacturers' Light and Heat Company, 1417 Chapline Street, Wheeling, West Virginia.

Cullinan, Dr. M. P. .... May 20, 1913
President and Manager, Border Gas Company, 619 Salinas Avenue, Laredo, Texas.

Culp, Harry C. .... May 15, 1917
Salesman, Ingersoll-Rand Company, Williamson Building, Cleveland, Ohio.

Cumings, C. E. .... May 19, 1914
President and General Manager, East Brady Gas Fuel Company, East Brady, Pennsylvania.

Cummings, Con. .... May 21, 1912
Contractor, 115 North Fourth Street, Independence, Kansas.

Cummings, E. A. .... May 15, 1917
Assistant Treasurer, Moncton Tramways, Electricity and Gas Company, Limited, Moncton, New Brunswick, Canada.

Cummings, Henry .... April 26, 1919
Field Foreman, The Manufacturers' Light and Heat Company, Canonsburg, Pennsylvania.

Cummings, M. J. .... April 26, 1919
Field Foreman, The Manufacturers' Light and Heat Company, Cameron, West Virginia.

Cummings, W. G. .... May 22, 1918
Proprietor, William G. Cummings, 803 Union Bank Building, Pittsburgh, Pennsylvania.

Cummins, C. L. .... May 18, 1920
President and General Manager, Cummins Engine Company, 7th and Jackson Streets, Columbus, Indiana.

Cunningham, George A. .... May 20, 1919
Chief Engineer, United Fuel Gas Co., P. O. Box 237, Charleston, West Virginia.

Cunningham, J. C. .... April 21, 1919
General Superintendent, West Virginia and Maryland Gas Company, Cumberland, Maryland.

Cunningham, R. H. .... May 16, 1916
Sales Engineer, Ingersoll-Rand Company, 1226 Farmers' Bank Building, Pittsburgh, Pennsylvania.

Curry, Elliott .... May 17, 1920
Foreman, Pennsylvania Gas Company, Leeper, Pennsylvania.

Curry, J. F. .... May 16, 1911
Superintendent of Distribution, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Curry, J. P. .... May 20, 1913
Agent, United Natural Gas Company, 15 Vine Street, Sharon, Pennsylvania.

Curtin, Emmett R., Sr. .... October 4, 1920
President, The Lima Natural Gas Company, 112 West Market Street, Lima, Ohio.

Curtis, Austin G. .... May 19, 1908
General Manager, Southwestern Gas and Electric Company, 116 Texas Street, Shreveport, Louisiana.

Cusack, W. M. .... May 20, 1913
Treasurer, Iroquois Natural Gas Company, 45 Church Street, Buffalo, New York.

Cushing, J. W. .... May 15, 1917
Oil and Gas Producer, 307 Hill Street, Sistersville, West Virginia.

Cushing, Robert W. .... May 19, 1908
Field Superintendent, Natural Gas Company of West Virginia, Leetonia, Columbiana County, Ohio.

Custer, Z. B. .... May 19, 1908
Vice President, Custer Coupling Company, 39 Foreman Street, Bradford, Pennsylvania.

Cypher, M. B. .... May 16, 1916
Contractor and Producer, Marwood, Pennsylvania.

Dailey, Benjamin S. .... May 7, 1920
Local Manager, Warren and Chautauqua Gas Company, 236 Pennsylvania Avenue, West, Warren, Pennsylvania.

Dallow, J. C. .... May 18, 1909
Representative, The National Supply Company, Lancaster, Ohio.

Dally, A. B., Jr. .... May 18, 1909
President and Manager, South Hills Oil and Gas Company, 223 Fourth Avenue, Pittsburgh, Pennsylvania.

Dally, A. L. .... April 25, 1919
Inspector, South Hills Oil and Gas Company, 223 Fourth Avenue, Pittsburgh, Pennsylvania.

Dally, C. A., Jr. .... May 20, 1913
Manager, Reserve Natural Gas Company of Louisiana, P. O. Box 191, Shreveport, Louisiana.

Daly, Martin B. .... May 18, 1909
President and General Manager, The East Ohio Gas Company, East Ohio Gas Building, 1405 East Sixth Street, Cleveland, Ohio.

Dana, J. W. .... May 9, 1919
Attorney, Kansas City Gas Company, 908-910 Grand Avenue, Kansas City, Missouri.

Davidson, John....................May 20, 1919
Producer, Cabin Creek Gas Company, Charleston, West Virginia.

Davies, Oley L.....................May 18, 1915
Agent, United Fuel Gas Company, 1406 Sixth Avenue, Huntington, West Virginia.

Davies, J. P.....................January 1, 1919
Foreman, Reserve Gas Company, Wilsonburg, West Virginia.

Davis, A. S.....................May 20, 1919
A. S. Davis Company, (Oil Producer), Vandergrift Building, Pittsburgh, Pennsylvania.

Davis, Herbert R.....................May 21, 1907
General Superintendent, Dominion Natural Gas Company, Ltd., 638 Ellicott Square, Buffalo, New York.

Dawes, Beman G.....................May 17, 1910
President, Columbus Gas and Fuel Company, 135 North Front Street, Columbus, Ohio.

Davis, Merrill N.....................January 1, 1920
Special Representative, S. R. Dresser Manufacturing Company, Boyleston Street, Bradford, Pennsylvania.

Dawes, Henry M.....................May 17, 1910
President, Pulaski Gas Light Company (Little Rock, Arkansas), 1615 Harris Trust Building, Chicago, Illinois.

Dawson, T. C.....................
Oil Producer, 318 Thompson Avenue, East Liverpool, Ohio.

Day, A. B.....................February 6, 1919
General Manager, Los Angeles Gas and Electric Corporation, 645 South Hill Street, Los Angeles, California.

Day, J. C.....................May 19, 1919
District Foreman, Hope Natural Gas Company, R. F. D. No. 1, Kincheloe, West Virginia.

Deal, E. O.....................May 15, 1917
Chief Clerk, The East Ohio Gas Company, 714 High Street, S. W., Canton, Ohio.

Dean, C. E.....................May 20, 1919
Local Manager, Newark Natural Gas and Fuel Company, Belleville, Ohio.

Deck, John....................April 23, 1919
Director, The Commercial Oil and Gas Company, Conneaut, Ohio.

Deemer, F. C.....................May 18, 1909
Gas and Oil Operator, 200 Jefferson Street, Brookville, Pennsylvania.

DeForest, C. W.....................May 15, 1917
Electrical Engineer, Union Gas and Electric Company. Fourth and Plum Streets, Cincinnati, Ohio.

Delaney, Daniel....................February 4, 1920
Superintendent of Meter Department, People's Natural Gas Company, 2920 West Liberty Avenue, Dormont, Pennsylvania.

Delaney, Joseph P.....................May 20, 1913
City Superintendent, The Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Denning, Leslie B. .... May 16, 1911
President, Lone Star Gas Company, 2017 Farmers' Bank Building, Pittsburgh, Pennsylvania.

Denton, Dorr T. .... May 15, 1917
Division Superintendent, Iroquois Natural Gas Company, 46 Clarendon, Buffalo, New York.

Derwent, Watson E. .... May 17, 1920
Vice President, George D. Roper Corporation, Rockford, Illinois.

Devericks, Filmore C. .... May 16, 1916
General Manager, Camden Natural Gas Company, Box 462, Fairmont, West Virginia.

DeWall, W. A. .... May 10, 1919
Selling Agent, The Gutta Percha and Rubber Manufacturing Company, 220 Park Building, Pittsburgh, Pennsylvania.

DeWeese, Charles .... May 22, 1918
Assistant Superintendent Gas Distribution and Construction, Louisville Gas and Electric Company, 311 West Chestnut Street, Louisville, Kentucky.

Dibbens, W. J. .... May 19, 1908
Vice President and General Manager, Guthrie Gas Light, Fuel and Improvement Company, 213 East Oklahoma Avenue, Guthrie, Oklahoma.

Dickey, Horace C. .... May 17, 1919
Operating Superintendent, The Koppers Company, Union Arcade, Pittsburgh, Pennsylvania.

Dickinson, B. J. .... May 14, 1920
Auditor, Ouachita Natural Gas and Oil Company, Monroe, Louisiana.

Diescher, Alfred J. .... May 18, 1909
100 West 59th Street, New York, New York.

Dill, Thomas M. .... March 10, 1919
Purchasing Agent, Eastern Oil Company, West Virginia and Maryland Gas Company, Buffalo, New York.

Dillie, Lester F. .... May 20, 1919
Foreman, Waynesburg Home Gas Company, Waynesburg, Pennsylvania.

Dimick, W. H. .... May 20, 1913
Agent, The East Ohio Gas Company, 202 West High Street, New Philadelphia, Ohio.

Dingman, L. R. .... May 16, 1916
District Foreman, Equitable Gas Company, 635 Corey Avenue, Braddock, Pennsylvania.

Dittman, C. E. .... May 17, 1910
Manager, Waynesburg Home Gas Company, Waynesburg, Pennsylvania.

Dittman, D. M. .... May 15, 1917
Foreman, Iroquois Natural Gas Company, Hamburg, New York.

Dixon, Philip .... May 18, 1909
Superintendent, St. Marys Gas Company, St. Marys, Pennsylvania.

Dodds, Caryl J. .... June 12, 1906
General Manager, Citizens Light, Heat and Power Company, 5 East Eighth Street, Lawrence, Kansas.

Doebele, W. J. .... May 22, 1918
Agent, Ohio Fuel Supply Company, Miamisburg, Ohio.

Doherty, Henry L. .... February 27, 1906
President, Cities Service Company, 60 Wall Street, New York, New York.

Dolen, R. F. .... May 16, 1916
Foreman, Pittsburgh and West Virginia Gas Company, 965 West Pike Street, Clarksburg, West Virginia.

Donahue, T. C. .... May 15, 1917
Pressure Department, East Ohio Gas Company, 9301 Columbia Avenue, Cleveland, Ohio.

Donald, Joseph C. .... May 20, 1919
Inspector, Hope Natural Gas Company, 6838 Kelly Street, Pittsburgh, Pennsylvania.

Donaldson, F. N. .... May 16, 1911
Owner, Donaldson Gas Company, Jewett, Ohio.

Donehue, D. M. .... May 22, 1918
Producer, 412 East Walnut Street, Titusville, Pennsylvania.

Donelley, William F. .... May 19, 1919
Geneva, Ohio.

Donley, L. B. .... July 28, 1920
Auditor, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Donovan, B. H. .... May 20, 1913
Foreman, Pennsylvania Gas Company, Warren, Pennsylvania.

Dooling, F. T. .... May 15, 1917
Machinist, East Ohio Gas Company, 10601 Hathaway Avenue, Cleveland, Ohio.

Dorning, C. D. .... April 22, 1919
Chief Clerk, Union Natural Gas Corporation, Dormont, Pittsburgh, Pennsylvania.

Douglass, E. A. .... April 27, 1920
Manager, Horace G. Preston Company, 238 Fourth Avenue, Rooms 403 and 404, Pittsburgh, Pennsylvania.

Douglass, Silas M. .... May 18, 1909
General Counsel, Logan Natural Gas and Fuel Company, 22½ South Park Street, Mansfield, Ohio.

Douthirt, W. F. .... May 21, 1907
Fourth Vice President, United Gas Improvement Company, Broad and Arch Streets, Philadelphia, Pennsylvania.

Dove, Earl A. .... April 24, 1920
Local Manager, Logan Natural Gas and Fuel Company, Utica, Ohio.

Dowd, Bernard F. .... May 15, 1917
Manager, People's Natural Gas Company, 1071 Ellicott Square, Buffalo, New York.

Downing, C. W. .... May 20, 1913
Assistant Secretary and Treasurer, East Ohio Gas Company, East Sixth Street, Cleveland, Ohio.

Doyle, Frederick F...........May 19, 1914
Assistant Chief Engineer, Midway Gas Company, Box N, Taft, California.

Dreibelbis, H. H...........May 21, 1912
Division Superintendent, The Ohio Fuel Supply Company, 59 North Fourth Street, Zanesville, Ohio.

Dresser, Carl K...........May 15, 1917
501-505 World Building, Tulsa, Oklahoma.

Drocourt, V. S...........April 24, 1919
Foreman, Equitable Gas Company, 1427 Iseline Street, Pittsburgh, Pennsylvania.

Droppleman, W. J...........May 16, 1916
Foreman, Hope Natural Gas Company, McWhorter, West Virginia.

Drury, George F...........May 15, 1917
Oil Producer, J. W. Leonard Oil Co., North Main Street, Washington, Pennsylvania.

Duffield, C. S..........May 16, 1916
Purchasing Agent, United Fuel Gas Company, Quarrier Street, Charleston, West Virginia.

Duffy, Thomas..........May 17, 1920
Foreman, United Natural Gas Company, 52 South Oakland Avenue, Sharon, Pennsylvania.

Duncan, Edgar..........May 18, 1920
Manager, John Duncan and Son, Lancaster, Ohio.

Duncan, John..........May 16, 1911
General Manager of Sales, Wheeling Steel and Iron Company, Wheeling, West Virginia.

Dunham, W. S...........May 19, 1919
Repair Foreman, Reserve Gas Company, Weston, West Virginia.

Dunn, T. A...........May 15, 1917
Field Superintendent, Potter Gas Company, Shinglehouse, Pennsylvania.

Dunnington, F. D...........May 5, 1920
Superintendent, West Virginia Central Gas Company, Philippi, West Virginia.

Dupree, Fred..........May 14, 1920
Manager Station, Ouachita Gas Company, Monroe, Louisiana.

Duvall, E. P...........May 19, 1919
Hope Natural Gas Company, Grantsville, West Virginia.

Dykema, W. P...........May 20, 1919
Petroleum Engineer, U. S. Bureau of Mines, Bartlesville, Oklahoma.

Eagleson, Freeman T...........January 29, 1919
Attorney, The Ohio Fuel Supply Company, New First National Bank Building, Columbus, Ohio.

Eagleson, J. P...........May 17, 1919
Director, The Manufacturers' Light and Heat Company, Washington, Pennsylvania.

Eastell, R. T.....................May 20, 1919
Colona Manufacturing Company, 77 Vandergrift Building, Pittsburgh, Pennsylvania.

Eastland, S. H.....................May 16, 1916
District Foreman, Philadelphia Company, 2308 Main Street, Sharpsburg, Pennsylvania.

Eastman, C. C.....................May 6, 1920
Superintendent, Manufacturers' Gas Company, 42 South Street, Ridgway, Pennsylvania.

Eatherton, W. M.....................May 20, 1919
President, Vanlue Natural Gas Company, Vanlue, Ohio.

Ebert, Charles B.....................May 17, 1919
Inspector, Public Service Commission of West Virginia, Charleston, West Virginia.

Eckart, William J.....................May 20, 1919
Foreman, East Ohio Gas Company, New Philadelphia, Ohio.

Edgett, W. H.....................October 8, 1920
Secretary and Treasurer, The Caney Pipe Line Company, P. O. Drawer 278, Caney, Kansas.

Edmonson, J. T.....................April 26, 1919
Local Manager, The Logan Natural Gas and Fuel Company, 213 East Main Street, Carey, Ohio.

Edwards, William C.....................May 16, 1916
Vice President, Parker and Edwards Oil Company, Union Bank Building, Pittsburgh, Pennsylvania.

Egan, E. J.....................May 16, 1916
Agent, The Manufacturers' Light and Heating Company, Millbridge and Manton Streets, Pittsburgh, Pennsylvania.

Eister, Howard....................May 17, 1920
Salesman, Diamond Supply Company, 910 Quarrier Street, Charleston, West Virginia.

Elder, A. M.....................April 26, 1919
Agent, The Manufacturers' Light and Heat Co., Ellwood City, Pennsylvania.

Elder, Clyde....................May 20, 1919
Foreman, East Ohio Gas Company, Dennison, Ohio.

Elder, David....................April 24, 1919
Superintendent of Manufacture, Equitable Gas Company, 470 South Rebecca Street, Pittsburgh, Pennsylvania.

Elder, John D. P.....................May 18, 1920
Producer, Junction City, Ohio.

Elliott, Amos W.....................January 1, 1920
Assistant to Manager, California Natural Gas and Oil Company, 915 First National Bank Building, San Francisco, California.

Elliott, Ed. B.....................May 10, 1919
Logan Natural Gas and Fuel Company, East Gay Street, Columbus, Ohio.

Emmerling, Karl....................May 18, 1915
Chemist, The East Ohio Gas Company, 3105 Walton Avenue, Cleveland, Ohio.

Engle, T. W. .... May 19, 1914
Division Superintendent, Pittsburgh and West Virginia Gas Company, 537 West Main Street, Grafton, West Virginia.

Ennis, P. J. .... May 5, 1920
Superintendent, West Virginia and Maryland Gas Company, Lonaconing, Maryland.

Ernst, H. M. .... May 18, 1915
President, Dempseytown Gas Company, Trust Company Building, Oil City, Pennsylvania.

Espach, Frank .... May 18, 1915
Chief Inspector, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Estep, William .... April 26, 1919
Field Foreman, The Manufacturers' Light and Heat Company, Proctor, West Virginia.

Evans, C. D. .... May 16, 1911
Division Superintendent, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Evans, George M. .... May 22, 1918
Contractor, P. N. G. and Philadelphia Company, 156 McCargo Street, New Kensington, Pennsylvania.

Evans, H. S. .... May 7, 1920
Assistant to President, The Natural Gas Company of West Virginia, 323 Fourth Avenue, Pittsburgh, Pennsylvania.

Evans, J. J. .... May 18, 1915
Superintendent, Hope Natural Gas Company, 622 Dale Avenue, Clarksburg, West Virginia.

Evans, Todd .... May 22, 1918
Treasurer and Manager, Barnsdall Printing Company, 14 Chambers Street, Bradford, Pennsylvania.

Everets, H. L. .... April 15, 1919
Secretary-Treasurer, The Utica Gas, Oil and Mining Company, Utica, Ohio.

Ewing, A. M. .... May 17, 1920
Meter man, Southwestern Gas Company, Elk City, Kansas.

Ewing, Fenwick .... May 15, 1917
Leasing Superintendent, Medina Gas and Fuel Company, The Columbus Natural Gas Company, Wooster, Ohio.

Fahey, J. T. .... May 17, 1920
Leakage Department, United Natural Gas Company, Seneca Street, Oil City, Pennsylvania.

Fairchild, F. A. .... May 15, 1917
Agent, United Natural Gas Company, 901 Water Street, Meadville, Pennsylvania.

Failk, H. E. .... May 17, 1920
Chief Engineer, Hope Natural Gas Company, Hastings, West Virginia.

Fair, F. .... May 18, 1915
South Shore Natural Gas and Fuel Company, 307 Central Avenue, Dunkirk, New York.

Falk, G. E. .... May 15, 1917
Henry L. Doherty Company, 60 Wall Street, New York, New York.

Farner, J. W. .... May 16, 1916
Superintendent, Potter Gas Company, Port Allegany, Pennsylvania.

Fay, Peter .... May 15, 1917
Field Superintendent, Potter Gas Company, R. F. D. No. 2, Smethport, Pennsylvania.

Feeney, G. H. .... April 30, 1919
Inspector, People's Natural Gas Company, East McKeesport, Pennsylvania.

Fehlman, Louis Frederic .... May 8, 1919
Gas Fitter, Pennsylvania Gas Company, Warren, Pennsylvania.

Felix, Otto F. .... May 21, 1912
Secretary and Treasurer, Equitable Meter Company, 422 First Avenue, Pittsburgh, Pennsylvania.

Fenwick, James A. .... February 11, 1919
Salesman, Fenwick-Reddaway Manufacturing Company, Newark, New Jersey.

Fenwick, W. A. .... May 19, 1920
Sales Agent, Fenwick-Reddaway Manufacturing Company, Newark, New Jersey.

Ferguson, George L. .... May 17, 1920
Cashier, Athens Gas Light and Electric Company, South Court Street, Athens, Ohio.

Ferguson, H. L. .... May 20, 1919
Hope Natural Gas Company, Smithville, West Virginia.

Fessler, T. A. .... May 15, 1917
Agent, Potter Gas Company, Elkland, Pennsylvania.

Field, Roy A. ....
American Railways Company, 919 Witherspoon Building, Philadelphia, Pennsylvania.

Finley, H. F. .... May 16, 1916
The Logan Natural Gas and Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Finney, Frank .... May 17, 1910
Superintendent Gas Department, Indian Territory Illuminating Oil Company, Bartlesville, Oklahoma.

Firkel, Bert .... April 25, 1919
Superintendent, The Preston Oil Company, 626 East Main Street, Lancaster, Ohio.

Fisher, Daniel .... April 26, 1919
District Foreman, The Manufacturers' Light and Heat Company, Pittsburgh, Pennsylvania.

Fisher, Francis P. .... May 21, 1907
General Manager, Empire Gas and Fuel Company. Bartlesville, Oklahoma.

Fisher, H. A. .... May 22, 1918
Proprietor, H. A. Fisher Company, 336 Fourth Avenue, Pittsburgh, Pennsylvania.

Fisher, James P. .... May 22, 1918
Chief Technologist, Wichita Natural Gas Company, First National Bank Building, Bartlesville, Oklahoma.

Fisher, Mrs. Luella....................................May 17, 1920
Demonstrator of Economical Use of Gas, East Ohio Gas Company, 213 East Grant Street, Alliance, Ohio.

Fisler, J. H.....................................May 15, 1917
Clarence, New York.

Fitzgerald, James....................................April 21, 1919
Field Superintendent, West Virginia Central Gas Company, Weston, West Virginia.

Fitzgerald, T. P.....................................April 23, 1919
Director, The Commercial Oil and Gas Company, 306 Main Street, Ashtabula, Ohio.

Fitzgibbon, A. J.....................................May 22, 1918
Salesman, A. M. Byers Company, Union Bank Building, Pittsburgh, Pennsylvania.

Fleming, Arthur C.....................................May 18, 1915
Superintendent, Pennsylvania Fuel Supply Company, Broad Street, New Bethlehem, Pennsylvania.

Fleming, Claude M.....................................May 16, 1916
Foreman, Hope Natural Gas Company, 1333 Spring Street, Parkersburg, West Virginia.

Fleming, Robert L.....................................February 15, 1919
Oil and Gas Well Contractor, New Bethlehem, Pennsylvania.

Fleming, Thomas, Jr.....................................May 15, 1920
Production Department, Oil Well Supply Company, 215 Water Street, Pittsburgh, Pennsylvania.

Fletcher, John J.....................................April 26, 1919
Agent, The Manufacturers' Light and Heat Company, Bellaire, Ohio.

Flint, R. B.....................................May 15, 1917
Meter Inspector, Potter Gas Company, Port Allegany, Pennsylvania.

Flocken, Alfred F.....................................May 16, 1916
Bookkeeper, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Flosheim, Edgar N.....................................April 30, 1919
Manager, Ouachita Natural Gas and Oil Company, 118 North Grand Street, Monroe, Louisiana.

Foerst, George....................................April 21, 1919
Local Manager, The Buckeye Gas Company, Circleville, Ohio.

Foley, John....................................May 18, 1915
General Field Superintendent, The Manufacturers' Light and Heat Company, 119 Greenside Avenue, Canonsburg, Pennsylvania.

Foley, T. B.....................................May 16, 1916
Contractor, T. B. Foley, 410 Diamond Bank Building, Pittsburgh, Pennsylvania.

Foley, T. H.....................................May 16, 1916
Superintendent, T. B. Foley, Contractor, Waynesburg, Pennsylvania.

Foley, W. P.....................................May 17, 1920
The Manufacturers' Light and Heat Company, Box 262, McKeesport, Pennsylvania.

Fonner, J. H. .... May 16, 1916
Shop Foreman and Agent, The People's Natural Gas Company, 616 Midland Avenue, Midland, Pennsylvania.

Ford, George R. .... May 19, 1919
Gang Foreman, Hope Natural Gas Company, Salem, West Virginia.

Forker, J. B. .... April 1, 1919
Salesman, Oil Well Supply Company, Box 403, Oil City, Pennsylvania.

Forman, H. A. .... May 16, 1911
Vice President, Eastern Oil Company, 312 Fidelity Building, Buffalo, New York.

Forstall, Alfred E. .... May 21, 1912
Consulting Engineer, Forstall and Robison, 15 Park Row, New York, New York.

Foster, H. V. .... May 21, 1912
President, Indian Territory Illuminating Oil and Gas Company, 111 East Eighth Street, Bartlesville, Oklahoma.

Foster, J. E. .... May 20, 1913
Agent, The East Ohio Gas Company, 107 South Mill Street, Massilon, Ohio.

Fouts, M. S. .... May 20, 1919
Assistant Treasurer, United Fuel Gas Company, Charleston, West Virginia.

Fowler, Harry H. .... May 18, 1920
Land Agent, Manufacturers' Light and Heat Company, 907 Columbia Bank Building, Pittsburgh, Pennsylvania.

Fox, E. C. .... May 18, 1915
Manager, The Gas Appliance Company, 713 Frankfort Avenue, Cleveland, Ohio.

Frantz, I. D. .... May 16, 1916
Division Superintendent, Hope Natural Gas Company, 119 Daisy Street, Clarksburg, West Virginia.

Frazier, J. E. .... May 11, 1920
414 Kentucky Avenue, Charleston, West Virginia.

Freeland, F. D. .... May 22, 1918
Well Gauger, People's Natural Gas Company, Brave, Greene County, Pennsylvania.

Freeman, Harry D. .... April 26, 1919
District Foreman, The Manufacturers' Light and Heat Company, Bellaire, Ohio.

Freeman, W. W. .... May 18, 1915
President, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Frees, W. H. .... May 16, 1916
Rig Builder, 661 Buckeye Street, Wooster, Ohio.

French, F. A. .... May 15, 1917
Agent, Potter Gas Company, Coudersport, Pennsylvania.

Freudenberger, William ....
President, Freudenberger Oil Company, 504 Charleston National Bank Building, Charleston, West Virginia.

Frey, W. S. .... May 15, 1917
Agent, Logan Natural Gas and Fuel Company, 209 South Sandusky Street, Bucyrus, Ohio.

Friedenberg, D. .... May 18, 1909
Auditor, Union Natural Gas Corporation, Union Bank Building, Pittsburgh, Pennsylvania.

Friend, W. D. .... May 20, 1919
Representative, R. B. Montgomery and Company, 1st National Bank Bldg., Pittsburgh, Pennsylvania.

Fritz, John H. .... May 20, 1919
Local Manager, Logan Natural Gas and Fuel Company, Church Street, Amherst, Ohio.

Frohrieb, L. C. .... May 16, 1911
Secretary, Federal Engineering Company, 1116 House Building, Pittsburgh, Pennsylvania.

Frueauff, Frank W. .... May 19, 1920
Henry L. Doherty Company, 60 Wall Street, New York City, New York.

Fryer, Edward F. .... May 20, 1919
Gasoline Department, Hope Natural Gas Company, Clarksburg, West Virginia.

Fultz, Alston .... May 20, 1919
Machinist, Hope Natural Gas Company, Smithville, West Virginia.

Funk, W. T. .... May 18, 1915
Auditor, Oil and Gas Companies, Commercial Bank Building, Titusville, Pennsylvania.

Fye, J. L. .... May 16, 1911
Division Superintendent, Philadelphia Company, 240 Morgan Street, Waynesburg, Pennsylvania.

Gage, W. P. .... May 17, 1910
First Vice President and General Manager, Lone Star Gas Company, P. O. Box 1022, Fort Worth, Texas.

Gager, H. A. .... May 18, 1915
Clerk, The Natural Gas Company of West Virginia, 34 Garfield Avenue, Salem, Ohio.

Gaines, George .... April 26, 1919
Engineer in Charge, The Manufacturers' Light and Heat Company, Wallace, R. D. 1, West Virginia.

Galbraith, Ernest D. .... March 25, 1919
Superintendent Orifice Meters, East Ohio Gas Company, Cleveland, Ohio.

Gale, Glen N. .... May 15, 1917
Assistant Superintendent, Dominion Natural Gas Company, Hamilton, Ontario, Canada.

Gallagher, C. E. .... May 20, 1913
Agent, The East Ohio Gas Company, Youngstown, Ohio.

Gallagher, R. W. .... May 21, 1912
Acting President, Motor Castings Company, Akron, Ohio.

Gannon, M. R. .... May 19, 1920
General Foreman, East Ohio Gas Company, Cleveland, Ohio.

Garard, Charles H........................................May 19, 1914
Superintendent, Southern Ohio Division, The Ohio Fuel Supply Company, 124 North Pennsylvania Avenue, Wellston, Ohio.

Garard, F. L........................................May 16, 1916
Assistant Superintendent and Agent, Fayette County Gas Company, 403 First National Bank Building, Uniontown, Pennsylvania.

Garard, John M........................................May 18, 1909
Vice President and General Manager, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Gardner, C. W........................................May 16, 1916
Engineering Department, The East Ohio Gas Company, East Ohio Gas Building, Cleveland, Ohio.

Garner, J. B........................................May 16, 1916
Chemical Engineer, Hope Natural Gas Company, 424 Sixth Avenue, Pittsburgh, Pennsylvania.

Garr, L. E........................................April 19, 1919
Superintendent Gas Production, Osage Natural Gas Company, Caney, Kansas.

Garrity, M. J........................................May 16, 1916
District Foreman, Equitable Gas Company, 9th Street, McKeesport, Pennsylvania.

Gassett, A. L........................................May 19, 1908
President, Economy Stove Company, 2108 Superior Viaduct, Cleveland, Ohio.

Gates, C. A........................................May 20, 1919
Producer, Cabin Creek Gas Company, Charleston, West Virginia.

Gavin, A. W........................................May 15, 1917
Assistant City Superintendent, Iroquois Natural Gas Company, 667 E. Genesee St., Buffalo, New York.

Geddis, Craig.......................................May 19, 1920
Advertising Manager, Reading Iron Company, Reading, Pennsylvania.

Gehres, H. A........................................May 14, 1920
Engineer, The C. and G. Cooper Company, Mt. Vernon, Ohio.

Geilfuss, C. H........................................April 26, 1919
Assistant Secretary and Assistant Treasurer, The Manufacturers' Light and Heat Company, 248 Fourth Avenue, Pittsburgh, Pennsylvania.

Geist, J. F........................................May 16, 1916
Superintendent, United Fuel Gas Company, Ravenswood Pike, Spencer, West Virginia.

Germer, E. G........................................May 20, 1913
President, Germer Stove Company, 16th and Parade Streets, Erie, Pennsylvania.

Gericke, Oscar C........................................May 15, 1917
Domestic Coke Corporation, Fairmont, West Virginia.

Gessel, B. M........................................May 15, 1917
President and General Manager, Western Rope and Manufacturing Company, Tulsa, Oklahoma.

Gibson, C. A. .... May 19, 1908
Kansas Natural Gas Company, P. O. Drawer 465, Independence, Kansas.

Gibson, W. E. .... May 15, 1919
Sales Agent, South Chester Tube Company, 801 Columbia Bank Building, Pittsburgh, Pennsylvania.

Giede, J. L. .... May 17, 1920
Superintendent, Citizens Gas and Electric Company, 119 Neufer Court, Elyria, Ohio.

Giegel, F. G. .... May 20, 1913
General Foreman, The Northwestern Ohio Natural Gas Company, 210-212 Huron Street, Toledo, Ohio.

Gifford, N. C. .... May 20, 1919
Clarion Gas Company, Box 44, Clarion, Pennsylvania.

Gilbert, A. J .... May 16, 1916
Foreman, Arkansas Natural Gas Company, Malvern, Arkansas.

Gill, E. B. .... October 3, 1918
Treasurer and General Manager, The Federal Oil and Gas Company, 617 Second National Building, Akron, Ohio.

Gill, John E. .... May 16, 1911
President, Manufacturers' Light and Heat Company, 310 Columbia Bank Building, Pittsburgh, Pennsylvania.

Gill, S. M. .... May 22, 1918
Assistant Credit Clerk, The East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Gindele, Albert H. .... May 18, 1915
Industrial Gas Engineer, Toledo Railway and Light Company, 1120 Norwood Avenue, Toledo, Ohio.

Glass, John .... May 16, 1911
Chief Engineer, Carnegie Natural Gas Company, 245 North Bridge Street, Waynesburg, Pennsylvania.

Glass, Roy .... May 16, 1916
Construction Engineer, Carnegie Natural Gas Company, Box 45, Hastings, West Virginia.

Glasgow, Arthur Graham .... May 21, 1912
Chairman, Humphreys and Glasgow, Ltd., 36 and 38 Victoria Street, London, S. W., England.

Gleason, C. W. .... May 20, 1913
Division Engineer, United Natural Gas Company, 507 North Street, Oil City, Pennsylvania.

Glover, W. B. .... March 16, 1920
Manager of Sales, Oil Well Supply Company, 213 Water Street, Pittsburgh, Pennsylvania.

Goble, Benjamin F. .... May 15, 1917
Foreman, United Natural Gas Company, Shinglehouse, Potter County Pennsylvania.

Goff, George S. .... May 17, 1910
General Manager, Crystal City Gas Company, 26 East Market Street, Corning, New York.

Goldey, Harry J. .... February 19, 1920
Assistant Secretary, Union Light, Heat and Power Company, Third and Court Avenues, Covington, Kentucky.

Goodrich, C. B. .... May 20, 1919
D. E. F. & G. Gas Company, Roulette, Pennsylvania.

Gorby, G. G. .... May 20, 1919
Assistant Foreman, Hope Natural Gas Company, Lumberport, West Virginia.

Goe, H. M. .... May 18, 1920
Division Superintendent Oil, Hope Natural Gas Company, 211 Webster Street, Clarksburg, West Virginia.

Graf, O. H. .... January 28, 1920
Purchasing Agent, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Graffis, Wm. H. .... May 20, 1913
Publisher (President) Gas Publishing Company (The Gas Record), 20 West Jackson Boulevard, Chicago, Illinois.

Graham, Lyman L. .... May 20, 1913
Secretary, United Natural Gas Company, 206 Seneca Street, Oil City, Pennsylvania.

Grant, C. E. .... May 18, 1915
Agent, Pennsylvania Fuel Supply Company, 416 Main Street, Emlenton, Pennsylvania.

Gray, A. R. .... May 16, 1916
Manager, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Gray, George K. .... May 14, 1919
Field Agent, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Gray, Homer R. .... May 20, 1913
Assistant Treasurer, Iroquois Natural Gas Company, Iroquois Building, Buffalo, New York.

Gray, J. F. .... May 20, 1913
Chief Engineer, The East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Gray, Wm. P. .... May 19, 1920
Engineer Compressing Station, Dominion Natural Gas Company, Canfield, Ontario, Canada.

Grear, W. S. .... May 19, 1908
District Superintendent, Welsbach Street Lighting Company of America, 122 South Michigan Avenue, Chicago, Illinois.

Gregory, Charles P. .... January 1, 1919
Bessemer Gas Engine Company, 1101 Bessemer Building, Pittsburgh, Pennsylvania.

Gregory, T. B. .... October 2, 1920
President, Union Heat and Light Company, Emlenton, Pennsylvania.

Greenawalt, Edward .... February 18, 1920
Foreman, Columbia Gas and Electric Company, Huntington, West Virginia.

Gribble, T. J. .... May 11, 1919
Foreman Gasoline Pet., Reserve Gas Company, Clarksburg, West Virginia.

Gribble, Wallace B. .... May 15, 1917
Special Representative, Hope Natural Gas Company, Gore Hotel, Clarksburg, West Virginia.

Griffin, J. J. .... Sept. 11, 1918
Superintendent, Wichita Pipeline Company, Box 313, Iola, Kansas.

Griggs, Henry L. .... May 17, 1920
General Sales Manager, The Bristol Company, Waterbury, Connecticut.

Griswold, Robert G. .... May 18, 1915
Chief Technologist, Henry L. Doherty and Company, 60 Wall Street, New York, New York.

Grobel, J. C. .... May 16, 1916
Vice President and Assistant Manager, Reynolds Gas Regulator Company, Anderson, Indiana.

Gronan, Herman .... February 18, 1920
Assistant Purchasing Agent, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Grosscup, Fred Paul .... May 18, 1915
President, Charleston-Dunbar Natural Gas Company, Charleston, West Virginia.

Grosscup, Paul B. .... May 18, 1915
Vice President and General Manager, Charleston-Dunbar Natural Gas Company, Charleston, West Virginia.

Groves, R. E. .... May 17, 1920
Secretary and Treasurer, Clarksburg Light and Heat Company, 509 Lie Street, Clarksburg, West Virginia.

Groves, William .... May 20, 1919
United Natural Gas Company, Van, Pennsylvania.

Grunder, F. D. .... May 15, 1917
Assistant General Sales Manager, Tube Department, Jones and Laughlin Steel Company, 412 Jones and Laughlin Building, Pittsburgh, Pennsylvania.

Guffey, Joseph F. .... May 16, 1911
Guffey-Gillespie Company, 1203 Union Bank Building, Pittsburgh, Pennsylvania.

Gurnsey, W. M. .... May 18, 1909
Superintendent, Crystal City Gas Company, 26 East Market Street, Corning, New York.

Guthrie, Sanford L. .... April 24, 1919
Foreman, Philadelphia Company, 13 Sycamore Street, Waynesburg, Pennsylvania.

Gwynn, E. F. .... May 18, 1909
President, Gwynn Gas Burner and Engineering Company, 713 Empire Building, Pittsburgh, Pennsylvania.

Hackett, John M. .... January 17, 1920
Salesman, Broderick and Bascom Rope Company, 805 North Main Street, St. Louis, Missouri.

Hackney, W. W. .... May 18, 1920
Sales Engineer, Western Gas Construction Company, 816 Kinnaird Avenue, Fort Wayne, Indiana.

Hackstaff, John D.....................................June 12, 1906
General Manager, Empire Pipe Line Company, Bartlesville, Oklahoma.

Hackstaff, Richard C.....................................May 15, 1917
Empire Pipe Line Company, Bartlesville, Oklahoma.

Hadley, F. L.....................................May 16, 1911
c/o Eddyston Oil Corporation, Room 1636, 120 Broadway, New York, New York.

Hadley, W. R.....................................May 19, 1908
Secretary-Treasurer, The Union Natural Gas Corporation, 1606 Union Bank Building, Pittsburgh, Pennsylvania.

Haflich, J. H.....................................May 19, 1919
The Medina Gas and Fuel Company, Wooster, Ohio.

Hagan, W. G.....................................May 18, 1915
Mechanical Engineer, The East Ohio Gas Company, 7918 Hough Avenue, Cleveland, Ohio.

Hageman, G. Russell....................................May 20, 1919
President, The Agnew Torpedo Company, 201 People's Bank Building, Zanesville, Ohio.

Hagen, O. C.....................................May 16, 1916
General Manager, Drilling Department, Ohio Fuel Supply Company, 75 Hoffman Avenue, Columbus, Ohio.

Hager, J. B.....................................April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Route No. 1, Freemansburg, West Virginia.

Haggerty, Arlis....................................May 20, 1919
Reserve Gas Company, Wilsonburg, West Virginia.

Halford, Charles D.....................................March 26, 1919
Chief of Order Department, East Ohio Gas Company, Cleveland, Ohio.

Hall, Clarence....................................April 19, 1919
Manager, Marshall Gas Company, Marshall, Texas.

Hall, C. T.....................................May 16, 1911
Oil and Gas Operator, Bula Oil Company, 74 Vandergrift Building, Pittsburgh, Pennsylvania.

Hall, Fred L.....................................May 20, 1919
President, The Pittsfield Gas Company, Oberlin, Ohio.

Hall, Herman H.....................................May 16, 1916
Agent, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Hall, T. A.....................................May 15, 1917
Engineer, Empire Companies, Bartlesville, Oklahoma.

Hamilton, E. E.....................................April 15, 1919
Statistician, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Hamilton, W. R.....................................May 18, 1915
729 Kennedy Building, Tulsa, Oklahoma.

Hamilton, F. C.....................................May 22, 1919
24 State Street, New York City, New York.

Hammack, C. E.....................................May 20, 1919
Inspector, The Logan Natural Gas and Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Hammon, M. E...May 15, 1917
Foreman, South Shore Natural Gas and Fuel Company, 307 Central Avenue, Dunkirk, New York.

Hampton, Robert S.....................................May 15, 1917
President, Frankfort, Kentucky, Natural Gas Company, Titusville, Pennsylvania.

Hanchett, P. C...May 20, 1919
Foreman, United Natural Gas Company, Titusville, Pennsylvania.

Hanks, J. G...May 20, 1913
Superintendent, The East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Hanley, D. S....May 15, 1920
Assistant to President, East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Hanley, T. Edward.....................................May 15, 1917
Superintendent, Hanley and Bird, 2 Main Street, Bradford, Pennsylvania.

Hann, Thomas D........................................May 16, 1911
General Manager, Greensboro Gas Company, Brownsville, Pennsylvania.

Hannah, W. E......................................February 2, 1920
Engineer, People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Hannan, Robert W......................................May 16, 1911
Oil and Gas Producer, 76-78 Vandergrift Building, Pittsburgh, Pennsylvania.

Hannon, D. W....May 15, 1917
Division Foreman, East Ohio Gas Company, 1007 Garfield Avenue, S. W., Canton, Ohio.

Hanst, John Faber................................October 15, 1918
706 Chamber of Commerce Building, Pittsburgh, Pennsylvania.

Hardel, Jean A...April 22, 1920
Assistant General Director, French Government Petroleum Service, 21 Rue Colonel Moll, Paris, France.

Hare, A. S...May 18, 1915
Cashier, The Natural Gas Company of West Virginia, 1226 Chaplin Street, Wheeling, West Virginia.

Hare, C. Willing..May 17, 1910
Manager, New Business Department, The United Gas Improvement Company, Broad and Arch Streets, Philadelphia, Pennsylvania.

Harley, E. F...April 25, 1919
Field Foreman, South Hills Oil and Gas Company, 223 Fourth Avenue, Pittsburgh, Pennsylvania.

Harney, H., Jr...May 15, 1917
Inspector, Iroquois Natural Gas Company, 83 Edna Place, Buffalo, New York.

Harrington, H. H........................................May 15, 1917
Superintendent, Citizens Gas and Electric Company, 1053 Broadway, Lorain, Ohio.

Harrington, W. A.......................................May 20, 1913
Superintendent, Clarksburg Light and Heat Company, Clarksburg, West Virginia.

Harris, George S.......May 20, 1913
Cashier, The East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Harrison, Grant......February 27, 1919
Foreman, East Ohio Gas Company, Box 162, Cuyahoga Falls, Ohio.

Hartung, Isaac P.......May 13, 1920
Field Superintendent, American Natural Gas Company, 406 Perrysville Avenue, West View, Pennsylvania.

Hartzell, A. C.......May 19, 1908
Treasurer, Greenville Natural Gas Company, Canal Street, Greenville, Pennsylvania.

Harvey, James......April 23, 1919
Field Manager, The Commercial Oil and Gas Company, R. F. D. No. 3, Ashtabula, Ohio.

Harwood, J. Arch......May 18, 1915
Civil Engineer, The Natural Gas Company of West Virginia, 41 Vine Street, Salem, Ohio.

Hassenfratz, Joseph F.......May 18, 1920
Assistant Engineer, Iroquois Natural Gas Company, 45 Church Street, Buffalo, New York.

Hastings, William......May 20, 1913
Division Superintendent, Iroquois Natural Gas Company, 306 Iroquois Building, Buffalo, New York.

Hawk, C. M.......May 15, 1917
Chief Engineer, Logan Natural Gas and Fuel Company, Sugar Grove, Ohio.

Hawkins, B. L.......May 16, 1916
Auditor, Eastern Oil Company, 312 Fidelity Building, Buffalo, New York.

Hawkins, C. R.......March 10, 1920
Treasurer, Eastern Oil Company, 312 Fidelity Building, Buffalo, New York.

Hay, Ralph W.......May 18, 1909
Assistant General Superintendent and Purchasing Agent, The Manufacturers' Light and Heat Company, 413 Columbia Bank Building, Pittsburgh, Pennsylvania.

Hays, Victor A.......May 21, 1907
General Auditor for Receiver, Kansas Natural Gas Company, Sixth and Maple Streets, Independence, Kansas.

Hazlett, Ira I.......May 16, 1916
Secretary, Jackson Pike Oil and Gas Company, New Lexington, Ohio.

Hazlett, P. S.......May 16, 1916
Foreman, Hope Natural Gas Company, West Union, West Virginia.

Healy, F. R.......May 18, 1915
Superintendent, Electrical Distribution, Union Gas and Electric Company, Fourth and Plum Street, Cincinnati, Ohio.

Healy, J. H.......May 16, 1916
Assistant Treasurer, Potter Gas Company, 21 East Fortieth Street, New York, New York.

Heard, T. J.......May 18, 1915
Secretary and Treasurer, Reserve Natural Gas Company of Louisiana, 208 Ward Building, Shreveport, Louisiana.

Hearn, J. M. .... April 21, 1919
Superintendent, West Virginia and Maryland Gas Company, Thomas, West Virginia.

Heasley, Harry .... May 16, 1911
President, Oklahoma Fuel Supply Company, Box 1441, Tulsa, Oklahoma.

Heaton, R. L. .... May 22, 1918
Assistant Chief Geologist, Medina Gas and Fuel Company, Box 134, Wooster, Ohio.

Heazlett, Frank .... May 16, 1916
Shop Foreman, The People's Natural Gas Company, Blairsville, Pennsylvania.

Heazlett, William .... May 16, 1916
Shop Foreman, The People's Natural Gas Company, Latrobe, Pennsylvania.

Heeps, Charles B. .... May 20, 1919
Citizens Gas and Electric Company, 1225 Eighth Street, Lorain, Ohio.

Heim, William L. .... May 15, 1919
General Superintendent, Sergeant Gas Company, Burrows, Pennsylvania.

Helm, Charles L. .... May 20, 1913
Agent, The East Ohio Gas Company, 137 Public Square, Wooster, Ohio.

Henderson, James .... May 22, 1918
Foreman, People's Natural Gas Company, Imperial, Pennsylvania.

Henderson, John I. .... May 16, 1916
Engineer, The Logan Natural Gas Company, 34 Ruggery Building, Columbus, Ohio.

Henderson, J. L. .... May 18, 1920
Clerk, Hope Natural Gas Company, Empire Building, Clarksburg, West Virginia.

Henning, Harry H. .... May 8, 1919
Cashier, The People's Natural Gas Company, 1016 South Avenue, Wilkinsburg, Pennsylvania.

Henning, M. H. .... May 18, 1915
Superintendent, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Henry, Orville K. .... May 18, 1920
Engineer, Dominion Natural Gas Company, Ltd., Bank of Hamilton Building, Hamilton, Ontario, Canada.

Henry, Wm. C. .... May 19, 1920
Charge Meter Readers, East Ohio Gas Company, 1307 Second Street, West, Canton, Ohio.

Herring, A. W. .... May 15, 1917
General Manager, The Commercial Oil and Gas Company, 172 Main Street, Ashtabula, Ohio.

Herron, F. W. .... May 15, 1917
Secretary, Producers Gas Company, 300 First National Bank Building, Olean, New York.

Hersman, Blaine..May 5, 1920
Superintendent, West Virginia and Maryland Gas Company, Rollsburg, West Virginia.

Hersman, S. B...April 21, 1919
Superintendent, West Virginia Central Gas Company, Buckhannon, West Virginia.

Hess, Frank H...May 21, 1919
People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Hess, H. J...April 1, 1919
Division Superintendent, Carnegie Natural Gas Company, 24½ Harrison Street, Munhall, Pennsylvania.

Hess, L. E...April 23, 1919
Commercial Representative, The Commercial Oil and Gas Company, 1661 Winton Avenue, Lakewood, Ohio.

Heuperman, F. J...May 18, 1915
Engineer, Calgary Gas Company, Limited, 215 Sixth Avenue, West, Calgary, Alberta, Canada.

Hickernell, George W...May 15, 1917
Agent, Pennsylvania Gas Company, 213 Second Avenue, Warren, Pennsylvania.

Higgins, John W...May 20, 1919
Agent, Medina Gas and Fuel Company, Nevada, Ohio.

Higgins, Robert H...April 19, 1920
Superintendent, The Marion Gas Company, 190 West Columbia Street, Marion, Ohio.

Higgins, W. C...May 20, 1913
Manager, Contract Department, The East Ohio Gas Company, East Ohio Gas Building, 1405 East Sixth Street, Cleveland, Ohio.

Hild, C. E...February 28, 1920
Secretary, Cumberland Gas Company, Freeport, Pennsylvania.

Hildabrand, J. S...May 16, 1916
Field Superintendent, South Hills Oil and Gas Company, R. F. D. No. 6, Mt. Oliver, Pennsylvania.

Hildebrand, H. D...May 19, 1914
President, Hope Engineering and Supply Company, Mt. Vernon, Ohio.

Hill, Charles E...May 18, 1915
Colonial Building, Winchester, Kentucky.

Hill, Dudley M...May 16, 1916
Assistant to Mechanical Engineer, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Hill, J. B...May 16, 1911
Manager, Welsbach Company, 621 Liberty Avenue, Pittsburgh, Pennsylvania.

Hillyer, A. V...April 23, 1919
Director, The Commercial Oil and Gas Company, 261 Prospect Street, Ashtabula, Ohio.

Hilty, John..May 16, 1916
Shop Foreman, The People's Natural Gas Company, 1707 Twentieth Avenue, Altoona, Pennsylvania.

Hinerman, George L.....................................May 19, 1914
Division Superintendent, Philadelphia Company of West Virginia, Weston, West Virginia.

Hines, Jesse Whaler....................................May 22, 1918
Chief Dispatcher (Gas), Empire Gas and Pipe Line Company, 100 North Creek Avenue, Bartlesville, Oklahoma.

Hitchcock, Otto G.....................................May 18, 1908
Secretary and General Manager, Hays Manufacturing Company, 12th and Liberty Streets, Erie, Pennsylvania.

Hitchman, R. W.....................................May 19, 1919
Manager Chart Department, United Fuel Gas Company, Charleston, West Virginia.

Hockenberry, H. L.....................................April 10, 1919
Manager, Smethport Gas Company, Smethport, Pennsylvania.

Hockstetter, Ralph....................................May 15, 1917
612 Fidelity Building, Buffalo, N. Y.

Hodge, W. H.....................................May 15, 1917
Publicity Manager, H. M. Byllesby Company, 208 South LaSalle Street, Chicago, Illinois.

Hodnett, E. L.....................................May 17, 1920
Treasurer, Sawnett Oil Corporation, Bolivar, New York.

Hoffman, H. R.....................................May 15, 1917
Chief Clerk, Iroquois Natural Gas Company, 131 Monroe Street, Buffalo, New York.

Hogan, J. J.....................................April 23, 1919
Director, The Commercial Oil and Gas Company, 126½ Main Street, Ashtabula, Ohio.

Hogg, Herman B.....................................May 18, 1915
Vice President, The National Supply Company of Pennsylvania, 314 Market Street, Parkersburg, West Virginia.

Holland, H. T.....................................May 15, 1917
Chief Engineer, Wheeler Compressing Station, The Northwestern Ohio Natural Gas Company, Sugar Grove, Ohio.

Holliday, J. M.....................................April 30, 1919
Assistant Secretary and Land Agent, West Farms Oil and Gas Company, 1501 Benedum-Trees Building, Pittsburgh, Pennsylvania.

Holly, W. M.....................................May 15, 1917
Broad Street, Butler, Pennsylvania.

Holmes, A. G.....................................June 12, 1906
Vice President and Manager, Pittsburgh Meter Company, P. O. Box 252, East Pittsburgh, Pennsylvania.

Holtz, W. H.....................................May 20, 1913
Chief Clerk, General Office, The East Ohio Gas Company, 1447 East Sixth Street, Cleveland, Ohio.

Hoover, F. W.....................................May 11, 1920
First Vice President and Director of Sales, Lucey Manufacturing Company, Chamber of Commerce Building, Pittsburgh, Pennsylvania.

Hoover, H. J. .... May 20, 1913
Commercial Manager, Gas Department, The Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.
President, The Natural Gas Association of America, 905 Oliver Building, Pittsburgh, Pennsylvania.

Hoover, Jackson D. .... May 20, 1919
Meter Man, Dominion Natural Gas Company, Limited, 15 Brucedale Avenue, Hamilton, Ontario, Canada.

Horn, William .... May 22, 1918
General Manager, Sure Oil and Gas Company, 523 Fourth Street, Marietta, Ohio.

Hornor, Boyd E. .... May 16, 1911
General Manager, Comet Oil and Gas Company, 225 West Pike Street, Clarksburg, West Virginia.

Hornor, Lynn S. .... May 16, 1911
President, Norwood Gas Company, 416 N. Pike Street, Clarksburg, West Virginia.

Horsley, George H. .... May 16, 1916
Purchasing Agent, East Ohio Gas Company, 1294 West 103rd Street, Cleveland, Ohio.

Horsley, George William .... May 17, 1920
Superintendent No. 2 Works, East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Horton, F. J. .... May 19, 1908
General Manager, Gem Oil and Gas Company, 402 South Elm Street, Iola, Kansas.

Horton, O. D. .... May 15, 1920
Engineer, Metric Metal Works, Erie, Pennsylvania.

Hottel, A. G. .... May 21, 1919
Field Foreman, Arco Oil Company, West Salem, Ohio.

Hottinger, R. L. .... May 18, 1909
Meter Repairer, Logan Natural Gas and Fuel Company, 534 Second Street, Fremont, Ohio.

Hovis, C. P. .... May 20, 1919
East Ohio Gas Company, 1815 Mahoning St., Youngstown, Ohio.

Hovis, W. A. .... May 16, 1916
Foreman, United Natural Gas Company, Clermont, Pennsylvania.

Howard, G. E. .... May 18, 1915
Master Mechanic, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Howard, R. B. .... May 16, 1916
Agent, Hope Natural Gas Company, 310 Dancer Avenue, Mannington, West Virginia.

Howard, W. C. .... May 15, 1917
Foreman, Brantford Gas Company, Limited, 315 Colborne Street, Brantford, Ontario, Canada.

Howe, J. C. .... May 20, 1919
General Agent, Empire Gas Company, Bartlesville, Oklahoma.

Howell, Francis K. .... May 20, 1919
Assistant Superintendent, Compressing Stations, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Hoyte, Walter S. .... May 21, 1907
Flint Hills Oil and Gas Company, P. O. Box 448, Wichita, Kansas.

Hubley, Grant .... May 20, 1919
Secretary, Oil Well Supply Company, Pittsburgh, Pennsylvania.

Huff, C. F. .... May 20, 1913
Agent, Pennsylvania Gas Company, Warren, Pennsylvania.

Hughes, L. G. .... May 17, 1920
Superintendent, The Texas Company, Natural Gas Department, Box 536, Eastland, Texas.

Hughes, Thos. E. .... April 26, 1919
Agent, The Manufacturers' Light and Heat Company, Pittsburgh, Pennsylvania.

Hughes, William K. .... May 21, 1912
Vice President, The Continental Supply Company, 918 Third National Bank Building, St. Louis, Missouri.

Hull, H. D. .... May 18, 1915
Empire Gas and Fuel Company, Bartlesville, Oklahoma.

Humphreys, Alexander C. .... May 21, 1912
President, Stevens Institute of Technology and Humphreys & Miller, Inc., 165 Broadway, New York, New York.

Hunter, Campbell M. .... May 20, 1913
Oil Mining Expert, 4 London Wall Buildings, London, E. C. 2, England.

Hunter, J. W. .... April 26, 1919
Agent, The Manufacturers' Light and Heat Company, Rochester, Pennsylvania.

Hunter, W. E. .... May 15, 1917
Vice President, Randall Gas Company, Morgantown, West Virginia.

Ingham, L. E. .... May 19, 1919
Orifice Meter Department, United Natural Gas Company, 308 Seneca Street, Oil City, Pennsylvania.

Irwin, J. W. .... May 16, 1916
Manager, Ohio Pipe and Supply Company, West Park, Ohio.

Irwin, R. W. .... May 15, 1917
Agent, The Ohio Fuel Supply Company, 120 South Detroit Street, Xenia, Ohio.

Isherwood, J. H. .... May 15, 1917
Gasoline Operator, Potter Gas Company, Shinglehouse, Pennsylvania.

Ivory, E. D. .... May 16, 1916
Commercial Manager, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Huot, C. F. .... April 24, 1919
Foreman, Allegheny Heating Company, 104 Ramsey Avenue, Carnegie, Pennsylvania.

Hurd, Franklin R. .... May 15, 1917
General Clerk, East Ohio Gas Company, 1407 East Sixth Street, Cleveland, Ohio.

Hurlburt, Alfred .... May 16, 1911
General Manager Philadelphia Company, 435 6th Ave., Pittsburgh, Pennsylvania.

Hurley, James H. .... May 18, 1920
Superintendent, Hanley Oil and Gas Company, Kane, Pennsylvania.

Hutchinson, Frank R. .... May 20, 1913
Sales Manager, The Gas Appliance Company, 713 Frankfort Avenue, West, Cleveland, Ohio.

Hutchinson, H. D. .... May 16, 1911
Contractor, 60 Lincoln Street, Uniontown, Pennsylvania.

Hutchinson, H. J. .... May 20, 1919
Central Kentucky Natural Gas Company, Lexington, Kentucky.

Hutchinson, J. E. .... May 16, 1916
Auditor, Lone Star Gas Company, Praetoriam Building, Dallas, Texas.

Hutchinson, N. M. .... May 17, 1920
Superintendent Experiment Station, Empire Gas and Fuel Company, First and Wyandotte Avenues, Bartlesville, Oklahoma.

Hutchinson, W. P. .... May 18, 1915
Vice President and Sales Manager, The Sprague Meter Company, Bridgeport, Connecticut.

Hutchison, E. H. .... May 18, 1915
Producer and Contractor, Harmony, Pennsylvania.

Hyatt, H. R. .... May 22, 1918
Chief Engineer, Logan Natural Gas and Fuel Company, Box 23, Pavonia, Ohio.

Jackson, F. W. .... March 27, 1919
Producer, Chicora, Pennsylvania.

Jacoby, H. L. .... May 15, 1917
Foreman, Producers Gas Company, Portville, New York.

James, F. W. .... January 31, 1919
Manager, The Union Natural Gas Company of Canada, Ltd., Chatham, Ontario, Canada.

James, Robert C. .... May 17, 1910
General Auditor, The United Gas Improvement Company, Broad and Arch Streets, Philadelphia, Pennsylvania.

Jamison, Guy A. .... May 19, 1919
Hope Natural Gas Company, Fairview, West Virginia.

Jarvies, T. B. .... May 19, 1908
Secretary, Jarvies Gas Burner, Heating and Plumbing Company, 4022 Belleview Avenue, Kansas City, Missouri.

Jasperson, R. O. .... May 17, 1920
Editor, The Gas Record, 20 West Jackson Boulevard, Chicago, Illinois.

Jay, C. H. .... May 16, 1916
General Auditor, Ohio Cities Gas Company, 135 North Front Street, Columbus, Ohio.

Jay, D. C. .... May 18, 1915
Superintendent, Leasing Department, United Fuel Gas Company, Quarrier Street, Charleston, West Virginia.

Jenkins, Howard .... May 16, 1916
Chief Engineer, Hope Natural Gas Company, Hardy Apartments, Mechanic Street, Clarksburg West Virginia.

Jenning, Clifford..May 17, 1920
Agent, United Natural Gas Company, 113 East Spring Street, Titusville, Pennsylvania.

Jester, Claude W.....................................January 30, 1919
Director, Pure Gasoline Company, 69 Wall Street, New York, New York.

Jimerson, Deo...May 18, 1915
Chief Engineer, Columbia Gas and Electric Company, R. F. D. No. 1, Kenova, West Virginia.

Johns, David...May 20, 1919
Hope Natural Gas Company, Jane Lew, West Virginia.

Johnson, Chas. M...April 26, 1919
Engineer in Charge, The Manufacturers' Light and Heat Company, Dallas, R. D. 1, West Virginia.

Johnson, C. W..May 15, 1917
Assistant to Vice President, Hope Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Johnson, David I.......................................January 28, 1920
Foreman, The People's Natural Gas Company, 114 Church Street, Turtle Creek, Pennsylvania.

Johnson, Frank...May 15, 1917
Fieldman, Iroquois Natural Gas Company, Collins Center, New York.

Johnson, Paul R..May 17, 1920
Manager, Southwestern Gas Company, 526 Citizens Bank Building, Independence, Kansas.

Johnson, Roswell H.......................................May 16, 1916
Consulting Geologist, Johnson and Huntley, 1039 Murrayhill Avenue, Pittsburgh, Pennsylvania.

Johnston, Norwood..May 20, 1919
1301 Union Arcade, Pittsburgh, Pennsylvania.

Joiner, A. W..May 20, 1919
Superintendent, Machine Shop, Hope Natural Gas Company, Clarksburg, West Virginia.

Jolliffe, J. A...March 12, 1920
Chief Field Agent, Pittsburgh and West Virginia Gas Company, Clarksburg, West Virginia.

Jones, E. C...February 14, 1919
Leaser, Carnegie Natural Gas Company, Smithton, West Virginia.

Jones, E. T..May 15, 1917
Division Foreman, East Ohio Gas Company, Canton, Ohio.

Jones, George H...May 20, 1913
Vice President, East Ohio Gas Company, 26 Broadway, New York, New York.

Jones, Hoyle...May 18, 1915
Superior Tube Company, 301 Security Building, Kansas City, Missouri.

Jones, T. C..June 12, 1906
President, The Delaware Gas Company, 68 North Sandusky Street, Delaware, Ohio.

Jones, Thomas J...May 16, 1916
Manager, The Columbus Gas and Fuel Company, 135 North Front Street, Columbus, Ohio.

Jones, Thomas J...May 16, 1916
Superintendent, Hope Natural Gas Company, 330 Locust Street, Mannington, West Virginia.

Jordan, E. W...May 21, 1912
Kennedy Building, Tulsa, Oklahoma.

Jordan, G. E...May 19, 1920
Superintendent, Ouachita Natural Gas and Oil Company, Monroe, Louisiana.

Judge, W. J...May 20, 1913
President, National Fuel Gas Company, 26 Broadway, New York, New York.

Kaiser, W. H...May 17, 1920
Master Mechanic, Metric Metal Works, 726 West 9th Street, Erie, Pennsylvania.

Kane, Joseph C...May 21, 1919
General Manager, New Process Gas Company, 608 Chamber of Commerce Building, Pittsburgh, Pennsylvania.

Kanitz, Jacques..October 7, 1920
Bellevue Palace, Bern, Switzerland.

Keally, H. L...May 17, 1920
Assistant Sales Manager, Pittsburgh Screw and Bolt Company, Pittsburgh, Pennsylvania.

Keenan, J. E...May 16, 1916
District Foreman, Equitable Gas Company, 6306 Penn Avenue, Pittsburgh, Pennsylvania.

Keenan, W. M...May 21, 1919
General Foreman, East Ohio Gas Company, 212 Summit Avenue, Youngstown, Ohio.

Keefe, D. C...May 17, 1920
Mechanical Engineer, Ingersoll-Rand Company, 11 Broadway, New York, New York

Keller, E. L...May 21, 1919
General Manager, Ohio Fuel Oil Company, Kanawha National Bank Building, Charleston, West Virginia.

Kelley, E. J...May 17, 1920
Salesman, Quaker City Rubber Company, 211 Wood Street, Pittsburgh, Pennsylvania.

Kellogg, E. B...May 15, 1917
Superintendent, Alden-Batavia Natural Gas Company, 71 Main Street, Batavia, New York.

Kellogg, Franklin L...May 16, 1911
Republic Light, Heat and Power Company, Honeoye Falls, New York.

Kelley, G. F...February 14, 1919
Foreman, Hope Natural Gas Company, Weston, West Virginia.

Kellum, B. J...June 12, 1906
Manager, Western Department, Welsbach Company, 629 Washington Boulevard, Chicago, Illinois.

Kelly, B. S........................................May 12, 1920
Garman Natural Gas Company, Monroe, Louisiana.

Kelly, Frank D........................................May 8, 1920
Superintendent, Addison Gas and Power Company, Main Street, Addison, New York.

Kelly, W. F........................................May 20, 1919
Inspector, Berea Pipe Line Company, 109 Jacob Street, Berea, Ohio.

Kennedy, J. J........................................May 16, 1911
General Manager of Sales, National Tube Company, Frick Building, Pittsburgh, Pennsylvania.

Kennedy, John.......................................May 20, 1919
Cashier, Hope Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Kenny, H. J........................................May 20, 1919
Foreman, Hope Natural Gas Company, Sistersville, West Virginia.

Kent, William T........................................May 22, 1918
Director, Tiona Gasoline Company, Brave, Pennsylvania.

Kerr, A. N........................................May 15, 1917
General Superintendent, Riverside Western Oil Company, 5575 Pocressett Street, Pittsburgh, Pennsylvania.

Kerr, T. H........................................May 18, 1915
Engineer, Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Kester, Chas. F........................................April 16, 1919
Cashier and Office Manager, The Gresselli Chemical Co., Clarksburg, West Virginia.

Ketchum, D. A........................................May 18, 1915
Assistant General Superintendent, United Fuel Gas Company, Quarrier Street, Charleston, West Virginia.

Ketler, W. G........................................May 16, 1916
Agent, The People's Natural Gas Company, 701 Center Street, Wilkinsburg, Pennsylvania.

Kidd, J. W........................................May 16, 1916
Chief Clerk, Hope Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Kiesel, Charles.......................................May 15, 1917
Foreman, East Ohio Gas Company, Box 125-A, Brooklyn Station, Cleveland, Ohio.

Kightlinger, A. D........................................May 16, 1917
Field Foreman, The Manufacturers Light and Heat Company, 61 East Wheeling Street, Washington, Pennsylvania.

Kile, L. W........................................May 20, 1919
President, Moore-Kile Company, 405 Exchange National Bank Building, Tulsa, Oklahoma.

Kilpatrick, R. B........................................May 18, 1915
Superintendent, Windsor Gas Company, 202 Ouellette Avenue, Windsor, Ontario, Canada.

Kimmel, C. F........................................May 16, 1916
Division Superintendent, Manufacturers Gas Company, Marlin Building, Brookville, Pennsylvania.

Kincheloe, L. G. .... May 16, 1916
Foreman, Hope Natural Gas Company, 319 St. Clair Avenue, Clarksburg, West Virginia.

Kind, Henry .... April 24, 1919
Foreman, Equitable Gas Company, 70 Mt. Vernon Street, West View, Pennsylvania.

King, E. J. .... May 18, 1915
Vice President, The Huntington Development and Gas Company, 928 Third Avenue, Huntington, West Virginia.

King, James .... May 16, 1916
Superintendent, Allegheny Heating Company, 603 West Diamond Street, N. S., Pittsburgh, Pennsylvania.

King, W. S. .... May 16, 1916
Field Foreman, The People's Natural Gas Company, Murraysville, Pennsylvania.

Kinley, George A. .... May 16, 1916
Assistant to the Vice President, Hope Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Kinney, W. H. .... May 18, 1920
Foreman, Dominion Natural Gas Co., Ltd., Paris, Ontario, Canada.

Kirk, F. W. .... May 21, 1912
Superintendent, Pipe Lines, Lone Star Gas Company, 214 Texas State Bank Building, Fort Worth, Texas.

Kiser, W. H. .... May 19, 1920
Drilling Contractor, Dominion Gas Company, Tellsonburg, Ontario, Canada.

Kiser, S. W. .... May 18, 1920
Foreman, Field Department, The East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Kitchen, John F. .... May 19, 1920
Designer, Metric Metal Works, Erie, Pennsylvania.

Klein, Charles .... May 20, 1919
Field Superintendent, American Natural Gas Company, Glenshaw, Pennsylvania.

Kline, Virgil P. .... May 20, 1913
Division Superintendent, Hope Natural Gas Company, Parkersburg, West Virginia.

Klingensmith, J. M. .... May 16, 1916
Agent, The Peoples Natural Gas Company, 116 Hawthorn Avenue, Greensburg, Pennsylvania.

Klise, John J. .... May 16, 1916
Treasurer and General Manager, The Klise, Eckstein, McCann Company, 332 East Fifth Street, Lancaster, Ohio.

Klumpp, John Bartleman .... May 19, 1908
Inspecting Engineer, United Gas Improvement Company, Broad and Arch Streets, Philadelphia, Pennsylvania.

Knapp, Isaac N. .... May 21, 1912
P. O. Box No. 1902, Philadelphia, Pennsylvania.

Knight, William H. .... May 19, 1908
General Manager, Cleveland Gas Meter Company, 2180 East 65th Street, Cleveland, Ohio.

Knowles, W. R.......................................May 16, 1916
Superintendent Pressure Department, The East Ohio Gas Company, 10832 Greenlawn Avenue, Cleveland, Ohio.

Knox, Clark......................................May 22, 1918
Salesman, Estate Stove Company, 73 North Linwood Avenue, Crafton, Pennsylvania.

Kohl, W. G.......................................May 15, 1917
Local Manager, Logan Natural Gas and Fuel Company, 10 South Pleasant Street, Norwalk, Ohio.

Koppel, A.......................................February 18, 1920
Bookkeeper, Columbia Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Kramer, C. W.......................................May 15, 1917
Chief Engineer, Arkansas Natural Gas Company, State Bank Building, Little Rock, Arkansas.

Krause, Charles......................................May 20, 1913
Inspector, The Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Krebs, Oscar C.......................................May 18, 1915
Superintendent of Construction, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Krick, Kay C.......................................February 27, 1906
Vice President, The Logan Natural Gas and Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Krohme, William L.......................................February 18, 1920
Cashier, Union Gas and Electric Co., Fourth and Plum Streets, Cincinnati, Ohio.

Krum, F. D.......................................May 22, 1918
Agent, Pennsylvania Gas Company, 1122 Peach Street, Erie, Pennsylvania.

Lackey, Frank......................................May 18, 1915
Superintendent, Crescent Oil and Gas Company, Glenwillard, Pennsylvania.

Lakamp, J. H.......................................May 20, 1913
General Superintendent, Operating Department, Union Gas and Electric Company, Fourth and Plum Street, Cincinnati, Ohio.

Lambert, Wm. T.......................................May 17, 1920
Associate Editor, The Gas Age, 52 Vanderbilt Avenue, New York City, New York.

Lambing, J. A.......................................May 18, 1909
1023 Franklin Avenue, Wilkinsburg, Pennsylvania.

Landis, H. K.......................................May 16, 1916
Managing Editor, The Gas Age, 52 Vanderbilt Avenue, New York, New York.

Lane, W. H.......................................May 22, 1918
Civil Engineer, Logan Natural Gas and Fuel Company, 47 North Hudson Street, Columbus, Ohio.

Langdon, Lawrence K.......................................February 18, 1920
General Counsel, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Lansley, John W.....................................May 18, 1915
Secretary, Southwestern Gas and Electric Company, 1615 Harris Trust Building, Chicago, Illinois.

Larkin, W. H.....................................May 18, 1909
Manager, Larkin and Company, Butler, Pennsylvania.

Lathrop, Alanson P.....................................May 17, 1910
President, American Light and Traction Company, The Equitable Building, 120 Broadway, New York, New York.

Lauderman, Edward....................................February 21, 1920
Superintendent, West Gas Works, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Laughlin, James P.....................................May 15, 1917
General Foreman, Street Department, The East Ohio Gas Company, 31 Merriman, Akron, Ohio.

Lavell, Lon....................................May 16, 1916
Foreman, Hope Natural Gas Company, Fairview, West Virginia.

Law, C. H.....................................May 16, 1911
General Superintendent, Ridgway Light and Heat Company, 16 North Broad Street, Ridgway, Pennsylvania.

Law, Robert, Jr.....................................May 16, 1911
President, The Quapaw Gas Company, 21 East Fortieth Street, New York, New York.

Layton, Miles B.....................................May 16, 1911
Assistant to President, Manufacturers Light and Heat Company, 312 Columbia Bank Building, Pittsburgh, Pennsylvania.

Leamon, William G.....................................May 16, 1917
Chemist, Medina Gas and Fuel Company, Liberty and Market Streets, Wooster, Ohio.

Leamy, Alan....................................May 18, 1909
Manager, Middle West Department, Welsbach Company, 116-122 East Chestnut Street, Columbus, Ohio.

Leard, R. C.....................................May 18, 1915
Superintendent, United Fuel Gas Company, Kermit, West Virginia.

Leathers, Harry M.....................................May 22, 1918
11707 Ohlman Avenue, Cleveland, Ohio.

Leathers, J. H.....................................May 16, 1916
Foreman, Equitable Gas Company, 306 Faller Apartments, Donora, Pennsylvania.

Lee, Thomas M.....................................May 20, 1913
Superintendent, Trunk Lines, The East Ohio Gas Company, Canton, Ohio.

LeFevre, Harry E.....................................May 17, 1910
Contractor and Stockholder, American Natural Gas Company, Lexington Avenue and Fourth Street, Aspinwall, Pennsylvania.

Lege, Fred M., Jr.....................................May 22, 1918
First Vice President and General Manager, Lone Star Gas Company, American Exchange National Bank Building, Dallas, Texas.

Leidicker, F. H.....................................May 16, 1916
Leidicker Tool Company, Marietta, Ohio.

Leight, Harry G. .... May 16, 1916
Foreman, Meter Repair Department, Logan Natural Gas and Fuel Company, Mansfield, Ohio.

Leland, Edward D. .... May 16, 1911
Assistant General Manager, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Lemaster, L. A. .... April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Shirley, West Virginia.

Lemley, F. W. .... April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Route No. 1, Orlando, West Virginia.

Leonard, Charles F. .... May 20, 1913
Gas Engineer, 220 Broadway, New York, New York.

Leonard, J. W. .... May 15, 1917
Oil Producer, J. W. Leonard Oil Company, 339 East Bean Street, Washington, Pennsylvania.

Lepper, C. W. .... January 22, 1920
Assistant General Purchasing Department, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Lepper, E. L. .... May 16, 1916
Local Manager, Logan Natural Gas and Fuel Company, 111 East North Street, Fostoria, Ohio.

LeRoy, Frank O. .... May 15, 1917
Chief Clerk, Chart Department, Hope Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Laslie, Frederick C. .... May 15, 1917
Auditor, The Manufacturers Light and Heat Company, 248 Fourth Avenue, Pittsburgh, Pennsylvania.

Lewis, A. H. .... May 20, 1913
Local Manager, Logan Natural Gas and Fuel Company, Mansfield, Ohio.

Light, George .... May 18, 1915
Superintendent, Dayton Gas Company, 234 North St, Clair Street, Dayton, Ohio.

Lillie, Lewis .... May 21, 1907
Third Vice President and Treasurer, The United Gas Improvement Company, Broad and Arch Street, Philadelphia, Pennsylvania.

Lindsay, Chas. .... May 18, 1920
Field Foreman, Dominion Natural Gas Company, Blackheath, Ontario, Canada.

Lindsay, Ernest .... May 18, 1920
Foreman, Dominion Natural Gas Company, Selkirk, Ontario, Canada.

Lindsay, Robert J. .... May 18, 1909
Secretary, Hope Engineering and Supply Company, 203 Cole Building, Tulsa, Oklahoma.

Lindsay, Roy .... May 15, 1917
Foreman, Dominion Natural Gas Company Limited, Dunnville, Ontario, Canada.

Linger, George P. .... May 14, 1919
Chief Field Agent, Pittsburgh and West Virginia Gas Company, Clarksburg, West Virginia.

Linner, C. F. .... May 18, 1920
Mine Foreman, Hope Natural Gas Company, Clarksburg, West Virginia.

Linsey, Charles J. .... May 20, 1919
Reserve Gas Company, R. F. D. No. 1, Weston, West Virginia.

Little, Perry A. .... May 15, 1917
Producer Natural Gas and Oil, White Building, Buffalo, New York.

Livingston, Hugh R. .... May 19, 1919
Accountant, Hope Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Lobaugh, W. H. .... May 15, 1917
Field Manager, Pavilion Natural Gas Company, Pavilion, New York.

Lockhart, Robert .... May 16, 1916
Custer City, Pennsylvania.

Logue, James J. .... May 16, 1916
Superintendent, Reserve Gas Company, 241 North River Avenue, Weston, West Virginia.

Lohr, G. C. .... May 18, 1915
Agent, The East Ohio Gas Company, 37 Main Street, Warren, Ohio.

Long, Frank U. .... May 19, 1920
Sales Department, Century Stove and Manufacturing Company, DuPont Place, Johnstown, Pennsylvania.

Long, George C. .... April 24, 1919
Philadelphia Company, R. D. No. 1, Ford City, Pennsylvania.

Long, W. A. .... May 16, 1916
Foreman, Arkansas Natural Gas Company, Vivian, Louisiana.

Longenecker, W. C. .... May 16, 1911
Treasurer, Toledo Pipe Threading Machine Company, 1445 Summit Street, Toledo, Ohio.

Looman, Otis C. .... April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Route No. 1, Oxford, West Virginia.

Lord, R. S. .... May 18, 1909
Vice President and Treasurer, Hope Engineering and Supply Company, Mount Vernon, Ohio.

Loveland, J. Elmer .... May 18, 1909
Local Manager, Logan Natural Gas and Fuel Company, Clyde, Ohio.

Lowe, Wm. H. .... April 26, 1919
Agent, The Manufacturers Light and Heat Company, Moundsville, West Virginia.

Lowther, H. C. .... May 19, 1919
Assistant Foreman, Hope Natural Gas Company, Jane Lew, West Virginia.

Lowther, M. L. .... May 20, 1919
Gang Foreman, Hope Natural Gas Company, 240 Broad Street, Weston, West Virginia.

Luebecker, Paul .... May 15, 1917
Compressing Station Department, Manufacturers' Light and Heat Company, Box 146, Hundred, West Virginia.

Lupher, Morton S. .... May 6, 1919
Drilling Contractor, 132 North High Street, Lancaster, Ohio.

Lupher, Preston W. .... May 18, 1908
Vice President, The Logan Natural Gas and Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Luse, John B. .... May 18, 1920
Hope Natural Gas Company, 26 Broadway, New York City.

Luther, George M. .... May 16, 1916
Foreman, The Manufacturers Light and Heat Company, 802 Third Street, Moundsville, West Virginia.

Lutz, C. H. ....
Dominion Natural Gas Company, Buffalo, New York.

Lynch, C. A. .... May 18, 1920
Sales Department, Fort Pitt Steel Casting Company, McKeesport, Pennsylvania.

Lynn, Clifford C. .... May 20, 1919
Superintendent, United Natural Gas Company, Shippensville, Pennsylvania.

Lynn, James T. .... May 21, 1907
1222 Ford Building, Detroit, Michigan.

Lyon, J. F. .... May 16, 1916
Meter Inspector, T. W. Phillips Gas and Oil Company, Butler, Pennsylvania.

Lytle, M. E. .... May 16, 1911
Superintendent, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

McAllister, C. E. .... February 18, 1920
Head Engineer, Columbia Gas and Electric Company, R. F. D. No. 1, Kenova, West Virginia.

McAllister, L. P. .... May 18, 1915
Engineer, Columbia Gas and Electric Company, Branchland, West Virginia.

McAninch, S. .... May 17, 1920
Field Foreman, United Natural Gas Company, Sigel, Jefferson County, Pennsylvania.

McCabe, John G. .... May 16, 1916
Shop Foreman, The Peoples Natural Gas Company, 1919 Forbes Street, Pittsburgh, Pennsylvania.

McCalmont, C. P. .... May 20, 1913
Superintendent, Pennsylvania Gas Company, Clarion, Pennsylvania.

McCandless, C. H. .... May 20, 1913
District Manager, United and Globe Rubber Manufacturing Company, 1419 Farmers Bank Building, Pittsburgh, Pennsylvania.

McCandless, Harry M. .... May 15, 1917
Agent, United Natural Gas Company, 12 South Brady Street, DuBois, Pennsylvania.

McClellan, Arthur .... May 16, 1916
Superintendent of Construction, Peoples Natural Gas Company, 108 Orchard Street, Woodlawn, Pennsylvania.

McClelland, J. Y. .... May 17, 1920
Field Foreman, The Manufacturers' Light and Heat Company, 121 East Franklin Street, Waynesburg, Pennsylvania.

McClintock, C. A. .... May 15, 1917
Field Foreman, The East Ohio Gas Company, 434 North Market Street, Danville, Ohio.

McClintock, J. T. .... May 18, 1915
President, Huntington Development and Gas Company, 928 Third Avenue, Huntington, West Virginia.

McClintock, T. E. .... May 20, 1919
Division Foreman, East Ohio Gas Company, R. F. D. No. 1, St. Clairsville, Ohio.

McCloy, S. D. .... May 16, 1916
Contractor, Any Company, 311 Ridge Avenue, Canonsburg, Pennsylvania.

McCloy, W. L. .... May 16, 1911
Care of Guffey-Gillespie Company, Tulsa, Oklahoma.

McConnell, H. H. .... May 16, 1916
Secretary and Treasurer, Pennsylvania Gas Company, 213 Second Avenue, Warren, Pennsylvania.

McConnell, Kenver .... May 17, 1920
Technical Manager, The Superior Oil and Refining Company, 210 Comstock Building, Columbus, Ohio.

McCord, J. W. .... May 18, 1909
Secretary and General Manager, Clintonian Fuel and Oil Company, 511 National Bank of Commerce Building, Columbus, Ohio.

McCormick, Edward P. .... May 16, 1916
Foreman, Iroquois Natural Gas Company, 37 Church Street, Buffalo, New York.

McCormick, L. M. .... May 15, 1917
Foreman, East Ohio Gas Company, 37 Main Street, Warren, Ohio.

McCrea, R. A. .... May 16, 1911
Construction Engineer, Pittsburgh Valve, Foundry and Construction Company, Box 1016, Pittsburgh, Pennsylvania.

McCuen, R. R. .... April 24, 1920
Bookkeeper, Logan Natural Gas and Fuel Company, 130 East Walnut Street, Ashland, Ohio.

McCune, D. B. .... May 16, 1911
Agent, The Natural Gas Company of West Virginia, 34 Garfield Avenue, Salem, Ohio.

McCune, S. A. .... May 21, 1912
Superintendent Gas Production, Empire Gas and Fuel Company, Drawer "F", Bartlesville, Oklahoma.

McCutcheon, Edward J. .... April 26, 1919
Traveling Auditor, Union Natural Gas Corporation, 40 Ruggery Building, Columbus, Ohio.

McDade, W. W. .... April 9, 1920
Manager, McDade Gas Company, 19 Greaves Street, Kane, Pennsylvania.

McDonald, Donald .... May 20, 1913
Vice President and General Manager, Louisville Gas and Electric Company, 311 West Chestnut Street, Louisville, Kentucky.

McDonald, L. H. .... March 4, 1920
Foreman, The East Ohio Gas Company, Wadsworth, Ohio.

McDonald, W. H. .... April 26, 1919
Field Foreman, The Manufacturers' Light and Heat Company, Slippery Rock, Pennsylvania.

McDowell, C. O. .... May 15, 1917
Superintendent, Kanawha Manufacturers' Gas Company, 2417 Washington Street, Charleston, West Virginia.

McDowell, Jesse Clark .... February 27, 1906
President, Empire Gas and Fuel Company, 1321 Farmers Bank Building, Pittsburgh, Pennsylvania.

McDowell, S. J. .... April 1, 1919
Division Superintendent, Carnegie Natural Gas Company, Leechburg, Pennsylvania.

McGowen, N. C. .... May 21, 1919
Vice President and General Manager, Louisiana Gas and Fuel Company, Merchants' Building, Shreveport, Louisiana.

McGuire, J. R. .... May 4, 1920
Superintendent, The Preston Oil Company, Union Furnace, Ohio.

McHenry, Carl H. .... May 20, 1919
Secretary, Monroe Gas Company, Monroe, Louisiana.

McHenry, M. A. .... May 15, 1917
Lease Superintendent, Medina Gas and Fuel Company, Front Street, Berea, Ohio.

McIlhenny, John D. .... May 17, 1910
President Gas Company of Montgomery County (Norristown, Pa.), 1339 Cherry Street, Philadelphia, Pennsylvania.

McIntyre, L. G. .... May 20, 1919
Construction, Hope Natural Gas Company, Hastings, West Virginia.

McIntyre, M. .... May 16, 1916
President and General Manager, Gowanda Natural Gas Company, 28 Main Street, Gowanda, New York.

McKay, E. F. .... May 20, 1919
Attorney Gas Division, The Empire Companies, Bartlesville, Oklahoma.

McKee, George R. .... May 16, 1916
Foreman, Consolidated Gas Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

McKee, William .... May 17, 1910
President, The Chaplin-Fulton Manufacturing Company, 34 Penn Avenue, Pittsburgh, Pennsylvania; President, The Association of Natural Gas Supply Company, Pittsburgh, Pennsylvania.

McKenzie, William Hunter .... February 27, 1906
General Manager, Wyandotte County Gas Company, Sixth and Main Avenue, Kansas City, Kansas.

McKimmie, J. E. .... May 15, 1917
Purchasing Agent, Dominion Natural Gas Company, Limited, 842 Marine National Bank Building, Buffalo, New York.

McKinley, E. P. .... May 20, 1919
Leasing Department, The Ohio Fuel Supply Company, Ashland, Ohio.

McKinley, M. R. .... May 13, 1920
Field Clerk, The Peoples Natural Gas Company, 526 Locust Street, McKeesport, Pennsylvania.

McKinney, C. B. .... May 15, 1917
North Texas Gas Company, Dallas, Texas.

McKinney, R. A. .... May 22, 1918
General Agent, The Manhattan Rubber Manufacturing Company, 475 Union Arcade Building, Pittsburgh, Pennsylvania.

McKirdy, John E. .... May 10, 1919
Advertising Manager, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

McKnight, S. C. .... May 20, 1913
Agent, The East Ohio Gas Company, Barberton, Ohio.

McLachlan, Benjamin H. .... May 19, 1920
Geologist, United Natural Gas Company, Oil City, Pennsylvania.

McLaughlin, E. J. .... May 20, 1919
District Foreman, Hope Natural Gas Company, West Union, West Virginia.

McMahon, J. F. .... May 20, 1913
P. O. Box 1008, Tulsa, Oklahoma.

McMahon, James W. .... May 18, 1909
General Manager, The Northwestern Ohio Natural Gas Company, 210-212 Huron Street, Toledo, Ohio.

McMahon, John .... May 20, 1913
Collector, Iroquois Natural Gas Company, 696 South Park Avenue, Buffalo, New York.

McMahon, John B. .... May 18, 1915
Attorney, The Northwestern Ohio Gas Company, Spitzer Building, Toledo, Ohio.

McMahon, John J. .... May 20, 1913
The East Ohio Gas Company, Cleveland, Ohio.

McMillan, John .... May 20, 1913
Superintendent, United Fuel Gas Company, Clendenin, West Virginia.

McMillin, Emerson .... May 17, 1910
Chairman, Board of Directors, The American Light and Traction Company, 120 Broadway, New York, New York.

McMunn, H. W. .... May 15, 1919
Lease Department, Union Natural Gas Corporation, Sixteenth Floor Union Bank Building, Pittsburgh, Pennsylvania.

McMunn, J. S. .... May 16, 1916
District Foreman, Equitable Gas Company, 108 Oakmont Avenue, Oakmont, Pennsylvania.

McNally, J. I. .... May 18, 1915
Electrolysis Expert, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

McNamara, Bernard .... May 17, 1920
General Foreman, East Ohio Gas Company, 3258 W. 112th Street, Cleveland, Ohio.

McNary, John B. .... May 18, 1915
Manager, Canadian Meter Company, 88 and 90 Caroline Street, Hamilton, Ontario, Canada.

McNary, J. F. .... May 19, 1914
Division Superintendent, Philadelphia Company of West Virginia, Union Bank Building, Clarksburg, West Virginia.

McNary, L. J. .... May 16, 1916
Foreman, Reserve Gas Company, 343 North River Avenue, Weston, West Virginia.

McNutt, M. .... May 19, 1920
Manager, McNutt Furnace Company, 457 Leader Building, Cleveland, Ohio.

McPherson, Edwin Allan .... May 15, 1917
301 Iroquois Building, Buffalo, New York.

MacBeth, Alexander B. .... May 21, 1907
Vice President and General Manager, Southern California Gas Company, 805 Garland Building, Los Angeles, California.

Mackie, Donald W. .... May 22, 1918
Manager, Bradford Supply Company, 416 West Pennsylvania Avenue, Warren, Pennsylvania.

MacLean, James O. .... May 10, 1920
MacLean and Company, 1710 First National Bank Building, Pittsburgh, Pennsylvania.

Mahan, G. F. .... May 21, 1907
Vice President, National Supply Company of Kansas, Independence, Kansas.

Mallory, Joe G. .... May 18, 1920
Foreman, Hope Natural Gas Company, 320 Staley Avenue, Clarksburg, West Virginia.

Mallory, L. E. .... May 21, 1912
Oil and Gas Business, L. E. Mallory and Son, Bradford, Pennsylvania.

Mallory, L. E., Jr. .... May 3, 1919
Lyceum Building, Bradford, Pa.

Malone, Edwin L. .... May 19, 1920
Superintendent, The Lima Natural Gas Company, 112 W. Market Street, Lima, Ohio.

Maloney, J. L. .... May 15, 1917
District Superintendent, Central Ohio Gas and Electric Company, Box 390, Wooster, Ohio.

Manning, William E. .... May 16, 1911
General Manager of Sales, Youngstown Sheet and Tube Company, Stambaugh Building, Youngstown, Ohio.

Mansfield, J. P. .... May 20, 1913
Superintendent, United Natural Gas Company, Van, Pennsylvania.

Markley, Joseph C. .... May 19, 1914
Treasurer, Southwestern Gas and Electric Company, 111 West Monroe Street, Chicago, Illinois.

Marley, Robert C. .... May 20, 1919
Advertising, Empire Gas and Fuel Company, 915 Commerce Building, Kansas City, Missouri.

Marple, M. R. .... May 16, 1916
Storekeeper, Equitable Gas Company, 23rd and Liberty Streets, Pittsburgh, Pennsylvania.

Marquis, H. H. .... May 15, 1917
Manager, Kane Supply Company, 17 Greaves Street, Kane, Pennsylvania.

Marriott, W. J. .... May 15, 1917
Foreman, Dominion Natural Gas Company, Ltd., Galt, Ontario, Canada.

Marsh, Harry S. .... January 31, 1920
Agent, People's Natural Gas Company, Midland Avenue, Box 138, Midland, Pennsylvania.

Marston, Edgar J. .... May 15, 1917
Treasurer, Texas and Pacific Coal Company, New York Office, 24 Broad Street, New York, New York; Thurber, Texas.

Martin, Edward P. .... May 20, 1913
Agent, The East Ohio Gas Company, 124 North Chestnut Street, Ravenna, Ohio.

Martin, F. W. .... May 16, 1916
Agent, Hope Natural Gas Company, 710 Wells Street, Sistersville, West Vivrginia.

Martin, Henry .... May 15, 1917
Oil Producer, J. W. Leonard Oil Company, 28 South Wade Avenue, Washington, Pennsylvania.

Martin, James .... May 20, 1913
Superintendent, No. 2 Works, The East Ohio Gas Company, East Sixty-second Street and L. S. and M. S. R. R., Cleveland, Ohio.

Martin, J. O. .... May 16, 1916
Contracting Agent, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Martin, John .... May 20, 1913
President, Midway Gas Company, 354 Pine Street, San Francisco, California.

Mascho, Charles W. .... May 20, 1913
Vice President, The National Supply Company, 136 Huron Street, Toledo, Ohio.

Mason, A. L. .... May 20, 1919
Cashier, The Logan Natural Gas and Fuel Company, 214 College Avenue, Ashland, Ohio.

Mason, Alphonso .... May 18, 1909
"The Ontario", Eighteenth Street and Ontario Road, Washington, D. C.

Mason, John A. .... April 10, 1919
Vice President, The Bartlett Hayward Company, Baltimore, Maryland.

Mason, John F. .... May 20, 1913
Superintendent of Distribution, United Natural Gas Company, 308 Seneca Street, Oil City, Pennsylvania.

Mason, Sidney .... May 17, 1910
President, Welsbach Company, Gloucester City, New Jersey.

Mason, W. K. May 22, 1918
Division Superintendent, Carnegie Gas Company, 1200 Seventh Street, Moundsville, West Virginia.

Masters, H. I. .... May 19, 1919
Foreman, Hope Natural Gas Company, R. R. No. 1, St. Marys, West Virginia.

Matheny, H. G. .... April 22, 1920
Bookkeeper, The Logan Natural Gas and Fuel Company, Box 295, Lancaster, Ohio.

Matheny, William..May 19, 1919
Meter Reader and Well Tender, Hope Natural Gas Company, Lumberport, West Virginia.

Mathieu, Louis..May 18, 1920
Agent, Manufacturers' Light and Heat Company, Steubenville, Ohio.

Matlock, Chauncey..June 1, 1920
Consulting Engineer, 949 Broadway, New York, New York.

Matson, J. R...May 20, 1913
Agent, The East Ohio Gas Company, 213 East Grant Street, Dennison, Ohio.

Mattiford, R. S...May 20, 1919
Chief Engineer, Hope Natural Gas Company, Clarksburgh, West Virginia.

Maxon, Harry R...May 18, 1915
President and General Manager, Maxon Premix Burner, Muncie, Indiana.

Maxon, John H...May 18, 1909
President and General Manager, The Central Indiana Gas Company, 301 East Main Street, Muncie, Indiana.

Mead, Carl D...May 16, 1916
Secretary-Treasurer, The Cadiz Gas Company, 114 North Main Street, Cadiz, Ohio.

Meals, S. W...May 16, 1911
Carnegie Natural Gas Company, 816 Carnegie Building, Pittsburgh, Pennsylvania.

Mechesney, C. A...May 16, 1916
Engineer, Equitable Gas Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Megraw, W. E...April 24, 1919
Foreman, Equitable Gas Company, 820 North Beatty Street, Pittsburgh, Pennsylvania.

Mellon, Porter D..May 20, 1913
Engineer, Calgary Gas Company, Limited, 215 Sixth Avenue, West, Calgary, Alberta, Canada.

Meredith, Austin..May 20, 1919
Pumping, Hope Natural Gas Company, Mole Hill, West Virginia.

Meredith, George B...May 16, 1916
Foreman, Hope Natural Gas Company, Smithfield, West Virginia.

Merriam, Dr. E. S...May 20, 1919
231 Fourth Street, Marietta, Ohio.

Merrill, Edwin C...May 21, 1912
Manufacturer, 2915 Smallman Street, Pittsburgh, Pennsylvania.

Metcalf, J. T...May 19, 1919
Superintendent, Lease Department, Empire Oil and Gas Company, McEldowney Building, Winchester, Kentucky.

Mettler, Lee B...June 12, 1906
Sales Engineer, Lee-Huckins Hotel, Oklahoma City, Oklahoma.

Merz, Frank..May 18, 1920
Pennsylvania Gas Company, Jamestown, New York.

Metz, Eugene..June 12, 1906
Representative, Metric Metal Works, 1517 Commerce Building, Kansas City, Missouri.

Michel, F. M. .... May 16, 1916
Foreman, United Natural Gas Company, 119 West Weber Avenue, DuBois, Pennsylvania.

Mickey, P. E. .... May 17, 1920
Foreman, Meter Department, East Ohio Gas Company, 1303 East Sixty-eighth Street, Cleveland, Ohio.

Mickley, M. A. .... May 18, 1909
Agent, The Marion Gas Company, 206 East Center Street, Marion, Ohio.

Miller, Alten S. .... May 21, 1912
Engineer, The Bartlett Hayward Company, Baltimore, Maryland.

Miller, Carroll .... May 21, 1912
Care of Guffey-Gillespie Company, 1203 Union Bank Building, Pittsburgh, Pennsylvania.

Miller, D. F. .... May 16, 1917
404 Clinton Building, Columbus, Ohio.

Miller, Fred A. .... May 19, 1908
President and General Manager, S. R. Dresser Manufacturing Company, 54 Boyeston Street, Bradford, Pennsylvania.

Miller, J. A. W. .... May 15, 1917
Assistant Superintendent, Pittsburgh Plate Glass Company, Ford City, Pennsylvania.

Miller, John A. .... May 22, 1918
Chief Engineer, The Preston Oil Company, Pavonia, Ohio.

Miller, L. L. .... May 16, 1916
Foreman, Fayette County Gas Company, Walnut Street, Uniontown, Pennsylvania.

Miller, R. R. .... May 16, 1916
Chief Clerk, Allegheny Heating Company, 603 West Diamond Street, North Side, Pittsburgh, Pennsylvania.

Miller, Silas S. .... May 19, 1920
Driller, Iroquois Natural Gas Company, Orchard Park, Erie County, Pennsylvania.

Miller, Thos. .... May 20, 1919
Chief Clerk, Hope Natural Gas Company, Empire Building, Clarksburg, West Virginia.

Miller, W. Frank .... March 6, 1919
Assistant Secretary and Treasurer, S. R. Dresser Manufacturing Company, Bradford, Pennsylvania.

Milligan, Samuel .... April 26, 1919
Field Foreman, The Manufacturers' Light and Heat Company, East Liverpool, Ohio.

Milliken, Rex P .... May 19, 1919
Foreman, Carnegie Natural Gas Company, Moundsville, West Virginia.

Milne, W. E. .... May 18, 1915
Manager, Gainesville Gas and Electric Company, 12 South Rusk Street, Gainesville, Texas.

Miner, Fred W. .... May 18, 1909
Vice President, The National Supply Company, 1306 Union Bank Building, Pittsburgh, Pennsylvania.

Mining, C. J...May 19, 1919
Superintendent of Measurement, Indian Territory Illuminating Oil Company, Bartlesville, Oklahoma.

Mitchell, C. S...May 16, 1911
Controller, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Mitchell, David E...April 17, 1920
Secretary, Union Natural Gas Corporation, 1002 Columbia Bank Building, Pittsburgh, Pennsylvania.

Moellenkamp, S. W...March 22, 1920
Manager, Natural Gas Company, Inc., 118 N. Grand Street, Monroe, Louisiana.

Moeller, William, Jr...May 19, 1908
Chief Engineer, Midway Gas Company, P. O. Box N, Taft, California.

Monroe, R. S...May 19, 1920
General Manager, Eastern Petroleum Company, 253 East Main Street, Clarksburg, West Virginia.

Montgomery, Hugh L...May 20, 1919
Manager New Business Department, Empire Gas and Fuel Company, Bartlesville, Oklahoma.

Montgomery, J. H...May 18, 1915
The Natural Gas Company of West Virginia, 96 Garfield Avenue, Salem, Ohio.

Montgomery, J. L...May 11, 1920
Superintendent, Marion Oil Company, Core, West Virginia.

Moore, Edgar M...May 18, 1915
Owner, Edgar M. Moore and Company, 709-710 Farmers' Bank Building, Pittsburgh, Pennsylvania.

Moore, Harry..April 26, 1919
Field Foreman, The Manufacturers' Light and Heat Company, Wallace, R. D. 1, West Virginia.

Moore, Lee C...May 16, 1911
President, Lee C. Moore and Company, 434 Oliver Building, Pittsburgh, Pennsylvania.

Moore, R. J...January 12, 1920
Assistant to the President, The Dayton Pipe Coupling Company, Dayton, Ohio.

Moran, P. A. ....May 16, 1916
District Foreman, Equitable Gas Company, Seventeenth and Wharton Streets, Pittsburgh, Pennsylvania.

Morgan, W. J...May 16, 1911
Agent, East Ohio Gas Company, 404 Tuscarawas Street, West; Canton, Ohio.

Morris, Henry C...May 17, 1910
General Manager, The Dallas Gas Company, 1715 Commerce Street, Dallas, Texas.

Morissey, P. J...May 22, 1918
General Manager, Johnstown Fuel Supply Company, 535 Vine Street, Johnstown, Pennsylvania.

Morrison, R. E.....................................May 20, 1919
Representative, Empire Gas and Fuel Company, 915 Commerce Building, Kansas City Missouri.

Morse, Nathan L.....................................May 16, 1916
Purchasing Agent, Southern California Gas Company, 300 Garland Building, Los Angeles, California.

Moses, Frank D.....................................May 20, 1919
Gas Engineering Company, Trenton, New Jersey.

Mowrey, John....................................May 16, 1916
Foreman, Hope Natural Gas Company, Clay Street, Clarksburg, West Virginia.

Moyer, W. Irwin....................................May 19, 1920
Geologist, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Mueller, Fred B.....................................June 12, 1906
Vice President, H. Mueller Manufacturing Company, Decatur, Illinois.

Mulkin, C. A.....................................May 17, 1920
Foreman, United Natural Gas Company, Stoneboro, Pennsylvania.

Mulkin, P. L.....................................May 20, 1913
United Natural Gas Company, Oil City, Pennsylvania.

Mull, Harry E.....................................May 18, 1920
Manager, Pincalo Gas and Oil Company, Emlenton, Pennsylvania.

Munce, John Russell....................................May 16, 1911
Vice President and General Manager, Arkansas Natural Gas Company, Shreveport, Louisiana.

Munro, W. Lorne....................................May 16, 1916
Auditor, Dominion Natural Gas Company, Main Street, Buffalo, New York.

Murphy, John B.....................................May 19, 1920
Oil Producer, 365 Main Street, Washington, Pennsylvania.

Murphy, Martin....................................February 18, 1920
Record Clerk, Union Gas and Electric Company, 1709 State Avenue, Cincinnati, Ohio.

Murphy, Owen....................................May 17, 1920
Emerald Petroleum Company, 58 West Maiden Street, Washington, Pennsylvania.

Murphy, S. E.....................................May 22, 1918
Manager, Empire Gasoline Company, Drawer "F", Bartlesville, Oklahoma.

Murphy, S. F.....................................May 16, 1916
Foreman, United Natural Gas Company, Halsey, Mt. Jewett, P. O., Pennsylvania.

Murray, Franklin C.....................................May 22, 1918
Representative, The B. F. Goodrich Rubber Company, Akron, Ohio.

Murray, John J.....................................May 16, 1911
Superintendent City Division, Equitable Gas Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Murray, M. J.....................................May 15, 1917
East Ohio Gas Company, Cleveland, Ohio.

Murry, J. S...May 7, 1920
Engineer, The Natural Gas Company of West Virginia, 323 Fourth Avenue, Pittsburgh, Pennsylvania.

Murtaugh, James May 16, 1916
Field Superintendent, Ohio Fuel Supply Company, 760 East Main Street, Lancaster, Ohio.

Musser, H. A...May 20, 1919
Meter-Man, Central Kentucky Natural Gas Company, 326 East Third Street, Lexington, Kentucky.

Myers, E. E...May 16, 1916
Agent, The People's Natural Gas Company, New Kensington, Pennsylvania.

Myers, Harry V...April 24, 1919
Foreman, Equitable Gas Company, Homestead, Pennsylvania.

Myers, Jas. S...April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Jacksonburg, West Virginia.

Nagel, Alex. J...May 10, 1920
Agent, Consumers Gas Company, Miami, Oklahoma.

Nash, John J...May 18, 1915
General Manager, Huntington Development and Gas Company, 1428 Seventh Avenue, Huntington, West Virginia.

Neely, Harold G...May 18, 1920
Lemon G. Neely Company, West South Street, St. Marys, Ohio.

Neely, Ira L...May 16, 1916
Superintendent, The Medina Gas and Fuel Company, Wooster, Ohio.

Neely, Lemon G...May 18, 1909
President, Neely-Clover Company, St. Marys, Ohio.

Neely, M. L...May 21, 1919
Neely-Clover Company, St. Marys, Ohio.

Nelson, H. E...May 15, 1917
Chief Engineer, Manufacturers' Gas Company, Erdice, Jefferson County, Pennsylvania.

Nestor, Joseph E...May 16, 1916
Chief Engineer, Manufacturers' Light and Heat Company, 1417 Chaplin Street, Wheeling,WestVirginia.

Nestor, W. E...May 20, 1913
Engineer, Manufacturers' Light and Heat Company, P. O. Box 607, Waynesburg, Pennsylvania.

Neville, William E...May 12, 1919
Representative, The Garlock Packing Company, 2761 West Fourteenth Street, S. W., Cleveland, Ohio.

Newbrandt, Philip G...February 21, 1920
Pressure Foreman, Union Gas and Electric Company, Box 47-a, R. F. D. No. 1, Cold Springs (Campbell County), Kentucky.

Newell, E. H...May 20, 1919
Chief Engineer, Gasoline Plant, Preston Oil Company, Union Furnace, Ohio.

Newhouse, B. Frank..May 16, 1916
Service Clerk, Union Gas and Electric Company, Southwest Corner Fourth and Plum Streets, Cincinnati, Ohio.

Newman, A. J...May 16, 1916
Comptroller, Union Natural Gas Corporation, 1607 Union Bank Building, Pittsburgh, Pennsylvania.

Nicoll, Thomas..May 19, 1914
Treasurer, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Nicholson, French..May 16, 1916
Foreman, Hope Natural Gas Company, Bridgeport, West Virginia.

Nickerson, Henry B...May 15, 1917
Secretary, American Steam Gauge and Valve Manufacturing Company, 208-220 Camden Street, Box 128, Back Bay, P. O., Boston, Massachusetts.

Nole, E. P...May 16, 1916
Field Foreman, The People's Natural Gas Company, Belle Vernon, Pennsylvania.

Nordensen, C. O...May 22, 1918
Manager, Duquesne Burner Service Company, Union Arcade Building, Pittsburgh, Pennsylvania.

Norris, Henry S...May 20, 1913
Secretary, Iroquois Natural Gas Company, Iroquois Building, Buffalo, New York.

Norris, Isaac S...April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Route No. 4, Mannington, West Virginia.

Northcott, G. A...May 18, 1915
Treasurer, Huntington Development and Gas Compnay, 1344 Third Avenue, Huntington, West Virginia.

Northup, Charles S...May 18, 1915
Attorney, The Northwestern Ohio Natural Gas Company, Spitzer Building, Toledo, Ohio.

Norton, Charles L...May 20, 1913
Manager, George C. Moon Company, Inc., 872 Rockefeller Building, Cleveland, Ohio.

Nutt, E. B...May 8, 1919
Auditor, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Nutter, O. D...May 17, 1920
Vice President, Acme Fishing Tool Company, 939 Williams Street, Parkersburg, West Virginia.

Nyhan, J. T...February 19, 1920
Power Department, The Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Oakland, Berny..December 20, 1918
Assistant Superintendent, The Monroe Gas Company, Inc., Union National Bank Building, Monroe, Louisiana.

O'Brian, T. F...May 19, 1914
The Texas Company, Box 983, Fort Worth, Texas.

O'Brien, William..May 19, 1914
President, O'Brien Steel Construction Company, Washington, Pennsylvania.

O'Connor, T. M...May 20, 1913
Stockkeeper, The East Ohio Gas Company, East Sixty-second Street and Lake Shore Railway, Cleveland, Ohio.

O'Day, John J. .... May 16, 1916
Agent, The Manufacturers' Light and Heat Company, 620 Maple Lane, Sewickley, Pennsylvania.

Odenkirk, H. B. .... May 16, 1916
Developer of Oil and Gas, East Liberty Street, Wooster, Ohio.

O'Donnell, John L. .... May 19, 1908
101 West Pennsylvania Ave., Warren, Pennsylvania.

Ogden, Fred E. .... May 19, 1920
President, Union Natural Gas Company of Canada, Ltd., 41 West Seneca Street, Buffalo, New York.

O'Hara, Charles .... April 26, 1919
Field Clerk, The Manufacturers' Light and Heat Company, Waynesburg, Pennsylvania.

O'Hara, Lawrence .... April 26, 1919
Field Foreman, The Manufacturers' Light and Heat Company, Waynesburg, Pennsylvania.

O'Hara, R. A. .... May 19, 1919
Clerk, Reserve Gas Company, Main Street, Weston, West Virginia.

O'Leary, Dennis .... May 20, 1913
Chief Engineer, Pennsylvania Gas Company, Ludlow, Pennsylvania.

O'Leary, Joseph F. .... March 3, 1920
Assistant Chief Engineer, Roystone Station, Pennsylvania Gas Company, Ludlow, Pennsylvania.

Oliphant, Bert C. .... May 21, 1912
President, Iroquois Natural Gas Company, 45 Church Street, Buffalo, New York.

Oliphant, F. H. .... May 15, 1917
Care of Metric Metal Works, Erie, Pennsylvania.

Oliver, C. E. .... May 20, 1913
Chief, Pressure Department, United Natural Gas Company, 206 Seneca Street, Oil City, Pennsylvania.

Oliver, C. H. .... May 20, 1919
Manager, Oil and Gas Men's Magazine, 312 Franklin Street, Butler, Pennsylvania.

Olmstead, J. F. .... May 16, 1916
Superintendent of Distribution, The Logan Natural Gas and Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Olney, George L. .... May 15, 1917
Superintendent Building Construction, The East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

O'Neill, Charles .... May 21, 1907
Superintendent of Distribution, Webb City and Carterville Gas Company, Carthage Gas Company, Webb City, Missouri.

Osborn, J. H. .... May 21, 1919
Meter Inspector, Logan Natural Gas and Fuel Company, Rocky River, Ohio.

Osborn, Orville .... March 19, 1919
Field Foreman, Logan Natural Gas and Fuel Company, Rocky River, Ohio.

Ossenbeck, Fred J. .... May 21, 1912
General Contracting, 507-508 Bliss Building, Tulsa, Oklahoma.

Ostermaier, John......................................May 16, 1916
District Foreman, Equitable Gas Company, Twenty-third Street and Liberty Avenue, Pittsburgh, Pennsylvania.

Ostyre, L. E...May 20, 1919
General Inspector, The East Ohio Gas Company, Cleveland, Ohio.

Ostyre, Peter L...May 16, 1916
Superintendent, Meter Department, East Ohio Gas Company, Hendon Avenue, West Park, Cleveland, Ohio.

Owens, Charles...May 13, 1920
Field Superintendent, American Natural Gas Company, Vandergrift, Pennsylvania.

Owens, J. F....May 22, 1918
Vice President and General Manager, Oklahoma Gas and Electric Company, Oklahoma City, Oklahoma.

Paine, Paul..May 20, 1919
Assistant to Vice President, Gypsy Oil Company, Tulsa, Oklahoma.

Palm, C. J...May 16, 1916
Superintendent, Lease Department, Logan Natural Gas and Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Palmer, J. F...May 16, 1916
General Superintendent, Arkansas Natural Gas Company, Ward Building, Shreveport, Louisiana.

Pannabecker, W. A........................................May 22, 1918
435 East Main Street, Lancaster, Ohio.

Parker, Charles C........................................May 19, 1919
Stationary Engineer, Hope Natural Gas Company, Smithville, West Virginia.

Parkinson, Thomas H...................................April 16, 1920
Publicity Man, Logan Natural Gas and Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Paris, A. J., Jr....May 16, 1916
Bradford, Pennsylvania.

Paris, W. Francklyn, L. H. D........................February 25, 1919
Scientific Research, Private Operator, 1802 Kanawha Street, Charleston, West Virginia.

Parks, R. N....May 18, 1915
Superintendent, Gasoline Stations, United Fuel Gas Company, Quarrier Street, Charleston, West Virginia.

Parsons, J. E....May 22, 1918
General Auditor, The Ohio Fuel Supply Company, 2017 Farmers Bank Building, Pittsburgh, Pennsylvania.

Parter, W. H....April 17, 1919
General Foreman, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Patterson, A. B...May 19, 1914
Manager, New York Belting Packing Company, 420 First Avenue, Pittsburgh, Pennsylvania.

Patterson, William M...................................May 18, 1909
In charge of Pipe Department, Frick Lindsay Company, 109 Wood Street, Pittsburgh, Pennsylvania.

Pattinson, R. L...May 19, 1914
President, Medina Natural Gas Company, 29 Fifth Street, Chatham, Ontario, Canada.

Payne, Christy..May 18, 1915
President: People's Natural Gas Company, Hope Natural Gas Company, Reserve Gas Company, River Gas Company; Vice President, East Ohio Gas Company, Room 1102, 26 Broadway, New York, New York.

Payne, Francis H...May 20, 1913
Manager, Metric Metal Works, Post Office Box 710, Erie, Pennsylvania.

Pearsall, Ed..February 26, 1919
Superintendent Drilling Department, East Ohio Gas Company, Newark, Ohio.

Pearsall, H. A...May 20, 1919
Foreman, The East Ohio Gas Co., Cleveland, Ohio.

Pearson, C. A...May 15, 1917
Master Mechanic, United Natural Gas Company, Oil City, Pennsylvania.

Pearson, H. B...May 19, 1914
General Superintendent, Calgary Gas Company, Ltd., 215 Sixth Avenue, Calgary, Alberta, Canada.

Peck, John V...May 18, 1920
The Michigan Stove Company, Detroit, Michigan.

Peden, D. V...May 22, 1918
Secretary to the President, The East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Pemberton, George M...February 18, 1920
Field Superintendent, Columbia Gas and Electric Company, Branchland, West Virginia.

Penhale, J. W...May 18, 1915
Superintendent, United Fuel Gas Company, Quarrier Street, Charleston, West Virginia.

Perdue, J. L...May 16, 1916
Chief Engineer, United Fuel Gas Company, Quarrier Street, Charleston, West Virginia.

Perry, E. R...May 15, 1917
Cosden Oil and Gas Company, Tulsa, Oklahoma.

Pettit, W. L...April 26, 1919
Motor Truck Foreman, The Manufacturers' Light and Heat Company, Pittsburgh, Pennsylvania.

Pew, James G...May 16, 1916
Superintendent, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Pew, John G...May 20, 1913
Vice President and General Manager, Sun Shipbuilding Company, 1428 South Penn Square, Philadelphia, Pennsylvania.

Pew, John N...April 26, 1919
Agent, The Manufacturers' Light and Heat Company, Canonsburg, Pennsylvania.

Pfeifer, A. S. .... May 13, 1920
Field Superintendent, American Natural Gas Company, Evans City,

Pfeiffer, A. C. .... May 17, 1920
Pennsylvania.
Shop Foreman, East Ohio Gas Company, Market Street, Wooster, Ohio.

Phillips, C. C. .... May 18, 1915
Chief Clerk, Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Phillips, D. H. .... May 15, 1917
Agent, Potter Gas Company, Port Allegany, Pennsylvania.

Phillips, John .... May 18, 1920
Engineer, Bessemer Gas Engine Company, Grove City, Pennsylvania.

Phillips, J. T. .... May 18, 1920
Engineer, Manufacturers' Light and Heat Company, Kansooth, West Virginia.

Phillips, S. H. .... May 17, 1920
Oil Foreman, Manufacturers' Light and Heat Company, Hundred, West Virginia.

Pick, Earle .... May 16, 1916
Agent, The People's Natural Gas Company, 448 Walnut Avenue, Greensburg, Pennsylvania.

Pierce, H. R. .... May 20, 1919
Assistant Natural Gas Engineer, U. S. Bureau of Mines, Bartlesville, Oklahoma.

Poland, John A. .... May 21, 1919
Attorney, Logan Natural Gas Company, Chillicothe, Ohio.

Polk, Robert E. .... April 1, 1919
Industrial Gas Engineer, Equitable Gas Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Poole, C. J. .... May 16, 1916
Agent, Fayette County Gas Company, 302 South Pittsburgh Street, Connellsville, Pennsylvania.

Pope, H. W. .... May 20, 1919
Medina Gas and Fuel Company, Wooster, Ohio.

Pope, James .... May 19, 1919
Foreman, The East Ohio Gas Company, 18 West Liberty Street, Girard, Ohio.

Pope, Worden .... May 16, 1916
Engineer, Henry L. Doherty and Company, 60 Wall Street, New York, New York.

Porter, C. E. .... August 3, 1918
Manager, Furnace Department, Standard Sanitary Manufacturing Company, 158 Flavel Street, Pittsburgh, Pennsylvania.

Porterfield, Harry .... May 16, 1916
Shop Foreman, The People's Natural Gas Company, 707 Center Street, Wilkinsburg, Pennsylvania.

Post, O. M. .... May 20, 1919
Division Foreman, Union Natural Gas Company, Wallaceburg, Ontario, Canada.

Powers, W. L. .... May 17, 1920
Ind. Gas Eng., George D. Roper Corporation, 1459 Leland Avenue, Chicago, Illinois.

Pratt, Charles E. .... May 16, 1916
Foreman, Equitable Gas Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Pratt, D. C. .... May 20, 1919
General Managear, Oil Purposes, Inc., Union Trust Building, Charleston, West Virginia.

Pratt, Edward G. .... May 21, 1912
Consulting and Managing Gas Engineer, 122 South Michigan Avenue, Chicago, Illinois.

Presho, A. A. .... May 15, 1917
Agent, Potter Gas Company, Westfield, Pennsylvania.

Preston, S. C. .... May 16, 1916
Chief Engineer, The People's"" 'Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Price, Frank W. ....
Foreman, Monongahela Natural Gas Company, Finleyville, Pennsylvania.

Price, W. W. .... May 18, 1909
President, Dayton Pipe Coupling Company, Edmun Street, Dayton, Ohio.

Prill, H. M. .... May 15, 1917
Cashier, Warren and Chautauqua Gas Company, 236 Pennsylvania Avenue, West, Warren, Pennsylvania.

Pringle, Frank L. .... May 19, 1920
Office Manager, The Lima Natural Gas Company, 112 W. Market Street, Lima, Ohio.

Pringle, R. S. .... May 15, 1917
Manager, Pringle Power Company, 139 Main Street, Bradford, Pennsylvania.

Prior, Charles J. .... May 20, 1913
Assistant to Manager, Metric Metal Works, 339 East Seventh Street, Erie, Pennsylvania.

Pryor, F. B. .... May 16, 1911
Superintendent, Gas Department, Monongahela Valley Traction Company, Fairmont, West Virginia.

Pugh, Ben F. .... February 19, 1920
Assistant Secretary, Union Light, Heat and Power Company, Third and Court Avenue, Covington, Kentucky.

Pugsley, Floyd M. .... May 8, 1920
Mechanical Engineer, Oil Producer, 16 West Corydon Street, Bradford, Pennsylvania.

Purdy, J. S. L. .... May 19, 1914
General Manager, The Pavilion Natural Gas Company, 68 Main Street, LeRoy, New York.

Pyle, B. A. .... May 17, 1920
Foreman, United Natural Gas Company, Petrolia, Pennsylvania.

Pyzel, E. D. .... May 17, 1910
Manager, Petrie and Company, Keizersgracht, 642-644 Amsterdam, Holland.

Quay, H. A...May 18, 1915
General Manager, Manufacturers' Light and Heat Company, Columbia Bank Building, Pittsburgh, Pennsylvania.

Quillinan, J. A...May 18, 1920
Field Manager, Castle Oil and Gas Company, Ltd., Imperial Bank Chambers, Niagara Falls, Ontario, Canada.

Quinlin, Ambrose J...May 20, 1913
General Foreman, The East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Quinlin, P. J...May 16, 1916
Shop Foreman, The River Gas Company, 228 Third Street, Marietta, Ohio.

Rady, M. A...May 5, 1919
Local Manager, The Logan Natural Gas and Fuel Company, Wellington, Ohio.

Rae, A. B...May 20, 1913
Foreman, The East Ohio Gas Company, 4706 Lorain Avenue, Cleveland, Ohio.

Ragusa, Joseph..
Interpreter, Foreign Labor, Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Raible, H. J...February 18, 1920
Paymaster, Union Gas and Electric Co., S. W. Cor. Fourth and Plum Streets, Cincinnati, Ohio.

Raisch, E. Jeremiah..September 12, 1919
Superintendent, Gas and Gasoline Department, Texas Pacific Coal and Oil Company, Box 304, Strawn, Texas.

Ralph, Charles A...May 18, 1915
Ralph Brothers, Aspinwall, Pa.

Ralston, William S...May 18, 1909
Vice President, Chaplin-Fulton Manufacturing Company, 34 Penn Avenue, Pittsburgh, Pennsylvania.

Ramage, J. R...May 16, 1916
Gas Salesman, Louisville Gas and Electric Company, 311 West Chestnut Street, Louisville, Kentucky.

Ramage, S. Y...May 20, 1919
Vice President, Union Natural Gas Corporation, Oil City, Pennsylvania.

Ramsey, E. C...May 15, 1917
Engineer in Charge of Field Pressure, Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Rand, J. R...May 20, 1919
Manager, Central Pipe Line Company, Aylmer, Ontario, Canada.

Randolph, Ernest,..May 19, 1914
Oil and Gas Operator, 510 Goff Building, Clarksburg, West Virginia.

Rankin, Harvey..May 16, 1916
Head Lineman, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Ratcliffe, George W...May 21, 1912
Treasurer, Manufacturers' Light and Heat Company, 248 Fourth Avenue, Pittsburgh, Pennsylvania.

Raymond, E. H.....................May 18, 1920
Cashier, The Citizens Gas and Electric Company, 1053 Broadway, Lorain, Ohio.

Ready, J. A.....................May 19, 1920
Foreman, The Natural Gas Company of West Virginia, Minerva, Ohio.

Rearick, Jesse....................May 22, 1918
Chief Engineer, Logan Natural Gas and Fuel Company, R. F. D. No. 6, Mt. Vernon, Ohio.

Reed, Charles C.....................May 16, 1916
Superintendent Gasoline Department, Hope Natural Gas Company, 310 Despard Street, Clarksburg, West Virginia.

Reed, F. L.....................May 16, 1916
Agent, The River Gas Company, 324 Fourth Street, Marietta, Ohio.

Reed, Ira B.....................May 15, 1917
Assistant Secretary and Treasurer, Iroquois Natural Gas Company, 45 Church Street, Buffalo, New York.

Reed, J. A.....................May 16, 1911
Assistant General Superintendent, Philadelphia Company, 435 Sixth Avenue, Pitsburgh, Pennsylvania.

Reed, J. H., Jr.....................May 16, 1911
General Purchasing Agent, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Reed, James H.....................May 16, 1916
Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Reeser, E. B.....................May 20, 1913
General Manager, Potter Gas Company, 21 East Fortieth Street, New York, New York.

Reeser, F. B.....................May 18, 1915
Care of Ohio Fuel Supply Company, Piqua, Ohio.

Reichel, C. D.....................May 20, 1913
Information and Complaint Clerk, The Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Reichert, Win....................May 16, 1916
Shop Foreman, The People's Natural Gas Company, 707 Center Street, Wilkinsburg, Pennsylvania.

Reid, W. H.....................May 10, 1920
Secretary and Treasurer, Pittsburgh Wire Rope Company, Verona, Pennsylvania.

Reiley, J. M.....................May 15, 1917
Purchasing Agent, Iroquois Natural Gas Company, Iroquois Building, Buffalo, New York.

Reiser, Charles L.....................May 15, 1917
Station Engineer, Iroquois Natural Gas Company, Collins Center, New York.

Remler, J. A.....................May 15, 1917
Superintendent, Compressor Station, Kansas Gas Company, Independence, Kansas.

Renick, J. D.....................May 20, 1919
Engineer, Logan Natural Gas and Fuel Corporation, Columbus, Ohio.

Rhodes, W. H. .... May 10, 1919
Superintendent, The Portsmouth Gas Company, 802 Chilliocothe Street, Portsmouth, Ohio.

Rich, A. R. .... May 18, 1915
236 Fifth Avenue, Huntington, West Virginia.

Rich, Edward B. .... May 16, 1911
1034 Commercial Trust Building, Philadelphia, Pennsylvania.

Richards, John B. .... May 11, 1920
Attorney, West Virginia Central Gas Company, Chamber of Commerce Building, Buffalo, New York.

Richards, W. H. .... May 16, 1916
Treasurer, Potter Gas Company, Port Allegany, Pennsylvania.

Richardson, R. E. .... May 5, 1919
Manager, The Lovell Gas and Electric Company, Lovell, Wyoming.

Richie, J. A. .... May 15, 1917
Secretary-Treasurer, Dominion Natural Gas Company, Limited, 842 Marine Bank Building, Buffalo, New York.

Richmond, H. A. .... April 26, 1919
Foreman, Gasoline Drying Stations, The Manufacturers' Light and Heat Company, R. F. D. 1, Dallas, West Virginia.

Riddle, George B. .... May 18, 1915
Superintendent, The Natural Gas Company of West Virginia, 1226 Chaplin Street, Wheeling, West Virginia.

Rider, Edgar C. .... May 17, 1919
Commissioner, Public Service Commission of West Virginia, Charleston, West Virginia.

Ridgway, J. L. .... May 16, 1916
Field Foreman, The People's Natural Gas Company, Brave, Pennsylvania.

Riggs, Ross .... May 19, 1914
Field Foreman, Northeastern Oil and Gas Company, R. D. No. 1, Jefferson, Ohio.

Riley, George N. .... May 16, 1911
Engineer, National Tube Company, Frick Building, Pittsburgh, Pennsylvania.

Ripley, Edwin F. .... April 16, 1919
Western Representative, The Gas Age, 770 People's Gas Building, Chicago, Illinois.

Ripley, L. O. .... May 21, 1912
Vice President and General Manager, Kansas Gas and Electric Company, 237-239 South Main Street, Wichita, Kansas.

Rippey, Thomas Y. .... February 21, 1920
Secretary to Manager, Gas Department, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Ritts, L. C. .... January 24, 1920
Secretary and Treasurer, Oklahoma Natural Gas Company, 117 West Fourth Street, Tulsa, Oklahoma.

Roberts, C. C. .... May 16, 1916
Superintendent, Southern Ontario Gas Company, 41 Queen Street, St. Thomas, Ontario, Canada.

Roberts, W. T. .... May 16, 1916
Inspector, Arkansas Natural Gas Company, Little Rock, Arkansas.

Robertson, A. W. .... October 7, 1920
General Attorney, Equitable Gas Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Robertson, D. .... May 16, 1916
Treasurer, Pittsburgh Oil and Gas Company, 1005 Farmers Bank Building, Pittsburgh, Pennsylvania.

Robertson, James D. .... May 22, 1918
Representative, Pittsburgh Valve Foundry and Construction Company, Pittsburgh, Pennsylvania.

Robertson, John D. .... May 21, 1912
Owner and Producer, Jacksonville, Ill.

Robinson, B. F. .... May 17, 1920
Clarksburg Light and Heat Company, Clarksburg, West Virginia.

Robinson, Edwin .... May 18, 1915
Secretary-Treasurer, West Virginia Natural Gas Association, Jacobs Building, Fairmont, West Virginia.

Robinson, J. B. .... April 17, 1919
Civil Engineer, Ohio Fuel Supply Company, 97 North Front Street, Columbus, Ohio.

Robinson, J. S. .... May 20, 1919
Warehouse and Ford Foreman, Hope Natural Gas Company, Mannington, West Virginia.

Robinson, L. E. .... May 21, 1912
General Manager, The Robinson Packer and Machine Company, 141 Spruce Street, Coffeyville, Kansas.

Roby, G. A. .... May 20, 1919
The East Ohio Gas Company, Dennison, Ohio.

Roby, H. P. .... May 15, 1917
Assistant Secretary-Treasurer, Inter-State Pipe Company, 1523 Oliver Building, Pittsburgh, Pennsylvania.

Rogers, Homer R. .... May 18, 1909
Agent, The Logan Natural Gas and Fuel Company, 29 South Washington Street, Tiffin, Ohio.

Rogers, S. P. .... May 20, 1919
Hope Natural Gas Company, Ellenboro, West Virginia.

Rockwell, Fred Gore .... May 18, 1920
Assistant Director Oklahoma Geological Survey, Norman, Oklahoma.

Rogers, Wm. G. .... May 17, 1920
Engineer, The East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Romano, M. .... May 16, 1916
Labor Supplied for Gas Companies, 119 Shetland Avenue, E. E., Pittsburgh, Pennsylvania.

Rooney, E. S. .... May 18, 1909
District Sales Agent, The Youngstown Sheet and Tube Company, 1626 Oliver Building, Pittsburgh, Pennsylvania.

Roper, E. S. .... May 17, 1920
Cashier, The Buckeye Gas Company, Circleville, Ohio.

Roper, George D. .... May 19, 1920
President, George D. Roper Corporation, Rockford, Illinois.

Rose, H. S. .... May 20, 1919
Auditor, United Natural Gas Company, 308 Seneca Street, Oil City, Pennsylvania.

Ross, C. E. .... May 18, 1920
Meterman, Carnegie Natural Gas Company, Toll Gate, West Virginia.

Ross, S. C. .... April 26, 1919
Agent, The Manufacturers' Light and Heat Company, Bellevue, Pennsylvania.

Rothert, E. R. .... May 18, 1915
Solicitor, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Rowan, Raymond C. .... May 15, 1917
Secretary to Vice President, The Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Rudert, Emil .... May 15, 1917
Contractor, Saxonburg, Pennsylvania.

Rumbaugh, G. N. .... May 16, 1916
Drilling Contractor, Independent Company, 347 North Fountain Avenue, Wichita, Kansas.

Rupp, C. H. .... May 18, 1915
Assistant Treasurer, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Rupp, W. F. .... April 25, 1919
Secretary and Treasurer, South Hills Oil and Gas Company, 223 Fourth Avenue, Pittsburgh, Pennsylvania.

Rush, Earl S. .... May 17, 1920
Engineer, Empire Gas and Fuel Company, 1212 Delaware Avenue, Bartlesville, Oklahoma.

Ruskaup, Benjamin H. .... March 21, 1919
Credit Man, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Russell, C. H. .... May 15, 1917
Chief Station Engineer, United Natural Gas Company, R. F. D. No. 1, Mt. Jewett, Pennsylvania.

Russum, R. C. .... May 15, 1917
Secretary-Treasurer, Quapaw Gas Company, First National Bank Building, Bartlesville, Oklahoma.

Ryan, W. G. .... May 16, 1916
110 Canfield Avenue, East; Detroit, Michigan.

Saeger, E. L. .... May 15, 1917
Foreman, East Ohio Gas Company, Barberton, Ohio.

Saltsman, Karl .... May 17, 1920
Secretary, The Klise-Eckstein McCann Company, Wooster, Ohio.

Sands, Louis C. .... May 18, 1909
Vice President, The Oil Well Supply Company, 215 Water Street, Pittsburgh, Pennsylvania.

Sands, W. C. .... May 19, 1919
Engineer in Charge of Material, Hope Natural Gas Company, Clarksburg, West Virginia.

Sarchet, A. C. .... May 16, 1911
Agent, The Ohio Fuel Supply Company, 142 North Ninth Street, Cambridge, Ohio.

Sargent, R. N. .... May 15, 1917
Works Manager, The Roessler and Hasslacher Chemical Company, St. Albans, West Virginia.

Sartorius, F. .... May 15, 1917
Treasurer, United Natural Gas Company, 308 Seneca Street, Oil City, Pennsylvania.

Satterwhite, James H. .... January 26, 1920
Manager, Westcott and Greis, 204 Drew Building, Tulsa, Oklahoma.

Savage, James .... May 18, 1920
1097 Ellicott Square, Buffalo, New York.

Sawyer, Walker E. .... May 17, 1920
President, New York State Gas Corporation, Bolivar, New York.

Scane, W. W. .... May 20, 1919
Secretary and Treasurer, Richmond Gas and Oil Company, Chatham, Ontario, Canada.

Schafer, F. J. .... May 15, 1917
Superintendent, Southern California Gas Company, 905 Garland Building, Los Angeles, California.

Schaffer, C. F. .... April 26, 1919
Field Foreman, The Manufacturers' Light and Heat Company, Coraopolis, Pennsylvania.

Schalek, John H. .... May 16, 1916
Meter Tester and Repairman, The Manufacturers' Light and Heat Company, Clarence Street, Duquesne Heights, Pittsburgh, Pennsylvania.

Schall, Henry D. .... May 17, 1910
Assistant to Vice President, Detroit Stove Works, 1320-60 Jefferson Avenue, Detroit, Michigan.

Scharpenberg, C. C. .... April 26, 1919
Efficiency Engineer of Producing Department, Standard Oil Company of California, 2300 Eighteenth Street, Bakersfield, California.

Schatzel, G. P. .... May 16, 1916
Local Manager, Logan Natural Gas and Fuel Company, 114 West Front Street, Findlay, Ohio.

Schauer, Frank F. .... May 21, 1912
Assistant Engineer, Kansas City Gas Company, 910 Grand Avenue, Kansas City, Missouri.

Schell, Charles .... April 22, 1919
Local Manager, The Bellevue Gas Company, Bellevue, Ohio.

Schell, George W. .... May 17, 1910
Myerstown, Lebanon County, Pennsylvania.

Schell, O. A. .... May 15, 1920
Engineer, United Natural Gas Company, Shinglehouse, Pennsylvania.

Schlaudecker, E. M. .... May 20, 1913
Agent, Pennsylvania Gas Company, 312-314 Cherry Street, Jamestown, New York.

Schlosser, A. J.....................May 16, 1916
Chief Engineer, Barnsdall Oil Company, Bartlesville, Oklahoma.

Schlosser, L. F.....................May 19, 1920
Chief Engineer, Potter Gas Company, Shinglehouse, Pennsylvania.

Schmidt, Elmer F. E.....................May 18, 1915
Chief Mechanical Engineer, Lone Star Gas Company, Dallas, Texas.

Schmidt, L. K.....................May 18, 1920
Purchasing Agent, Medina Gas and Fuel Company, Wooster, Ohio.

Schnee, C. F.....................October 3, 1918
Secretary, The Federal Oil and Gas Company, 617 Second National Bank Building, Akron, Ohio.

Schneider, M. C.....................May 19, 1914
Assistant General Superintendent, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Schulte, W. L.....................March 4, 1920
Foreman, The East Ohio Gas Company, Loudonville, Ohio.

Schum, H. B.....................May 19, 1919
Traffic Agent, Hope Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Schutt, H. L.....................May 20, 1919
Salesman, Wm. M. Crane Company, 16 West Thirty-second Street, New York City, New York.

Schwarm, C. A.....................March 31, 1920
Snperintendent, Natural Gas Department, The Texas Company, P. O. Box 44, Shreveport, Louisiana.

Schwenke, George S.....................April 22, 1920
Field Secretary, The Preston Oil Company, 69 West Front Street, Logan, Ohio.

Scott, Arthur C.....................April 16, 1919
Consulting Engineer, 601 Praetorian Building, Dallas, Texas.

Scott, G. C.....................May 18, 1909
Secretary-Treasurer, The Columbus Gas and Fuel Company, 135 North Front Street, Columbus, Ohio.

Scott, George E.....................May 17, 1920
Agent, United Natural Gas Company, 313 Main Street, Brookville, Pennsylvania.

Scott, Hobart....................May 18, 1920
Secretary-Treasurer, The Neely-Clover Company, St. Marys, Ohio.

Scott, John Milton....................May 18, 1909
Secretary-Treasurer, Kansas City Gas Company, 910 Grand Avenue, Kansas City, Missouri.

Scott, W. H.....................May 16, 1911
Teller, The Northwestern Ohio Natural Gas Company, 210-212 Huron Street, Toledo, Ohio.

Scoville, James....................May 15, 1917
Foreman, The East Ohio Gas Company, 19-21 North High Street, Akron, Ohio.

Seachrest, Charles E.....................April 26, 1919
Agent, The Manufacturers' Light and Heat Company, Washington, Pennsylvania.

Searle, Robert Meredith..................................May 21, 1912
Vice President, Rochester Railway and Light Company, 34 Clinton Avenue, North; Rochester, New York.

Sears, Clifton W...................................February 27, 1906
Assistant General Manager, East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Sedberry, W. H...May 16, 1911
Marshall, Texas.

Seem, Fred B...May 22, 1918
Superintendent, Empire Gas and Pipe Line Company, 304 Chickasaw Street, Bartlesville, Oklahoma.

Seep, Joseph..May 15, 1917
President, Central Kentucky Natural Gas Company, Oil City, Pennsylvania.

Segner, H. B...April 17, 1920
Plant Construction Equipment, H. B. Segner, 407 World Building, Tulsa, Oklahoma.

Seibel, John..May 16, 1911
Night Watchman, Logan Natural Gas and Fuel Company, 612 North Cory Street, Findlay, Ohio.

Seibert, H. E..April 26, 1919
Secretary and Assistant Treasurer, The Manufacturers' Light and Heat Company, 248 Fourth Avenue, Pittsburgh, Pennsylvania.

Seyffert, L. A..May 20, 1913
Treasurer, United Fuel Gas Company, Box 1256, Charleston, West Virginia.

Shaffer, D. C...May 18, 1915
Superintendent Distribution, Union Light, Heat and Power Company, Court and Park Place, Covington, Kentucky.

Shaffer, Hose...May 16, 1916
Foreman, The Manufacturers' Light and Heat Company, Washington, Pennsylvania.

Shanks, James C...May 19, 1920
General Superintendent's Office, East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

Shannon, Ogden K..May 17, 1910
Manager, The Fort Worth Gas Company, Eleventh and Throckmorton Street, Fort Worth, Texas.

Shannon, W. M..April 22, 1920
Superintendent, Preston Oil Company, Drilling Department, 140 E. Washington Street, Ashland, Ohio.

Sharp, E. V...May 19, 1919
Agent, East Ohio Gas Company, Doylestown, Ohio.

Sharp, R. C..April 14, 1919
Vice President, Oklahoma Natural Gas Company, Tulsa Oklahoma.

Shauer, George A...May 7, 1920
Chemical Engineer, Hope Natural Gas Company, 124 North Washington Street, Butler, Pennsylvania.

Shaughnessy, T. A..May 20, 1919
Foreman, Hope Natural Gas Company, Alum Bridge, Lewis County, West Virginia.

Shaw, Eugene Wesley................................October 14, 1918
Geologist, U. S. Geological Survey, Interior Department Building, Washington, D. C.

Shaw, S. T...May 16, 1916
Agent, The People's Natural Gas Company, 343 Main Street, Latrobe, Pennsylvania.

Shawkey, Harry P.....................................April 17, 1920
Shop Clerk, Pennsylvania Gas Company, 22 Jackson Avenue, Warren, Pennsylvania.

Shea, D. F...May 19, 1919
Pressure Department, The East Ohio Gas Company, 1360 East 125th Street, Cleveland, Ohio.

Shear, Robert..May 16, 1911
Secretary, Home Gas Company, Mt. Morris, Pennsylvania.

Shearon, B. P...May 20, 1919
Northern Indiana Gas and Electric Company, Hammond, Indiana.

Sheets, William L.......................................May 16, 1916
Clerk, Pittsburgh and West Virginia Gas Company, 608 East Center Street, Weston, West Virginia.

Shepard, W. H...May 19, 1908
Treasurer and Manager, Coffeyville Gas and Fuel Company, 112 West Eighth Street, Coffeyville, Kansas.

Sheppard, John C.......................................May 16, 1911
Superintendent, Chaplin-Fulton Manufacturing Company, 28-34 Penn Avenue, Pittsburgh, Pennsylvania.

Sherlock, Amy (Miss)..................................May 20, 1913
Assistant Secretary, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Sherwood, Henry..May 18, 1920
District Foreman, Carnegie Natural Gas Company, Smithton, West Virginia.

Sherwood, Matt G.....................................April 26, 1919
Field Foreman, The Manufacturers' Light and Heat Company, Atwood, West Virginia.

Shiebler, Marvin..May 17, 1910
Consulting Gas Engineer, 80 Broadway, New York, New York.

Shinn, David A...April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Central Station, West Virginia.

Shinn, T. E...April 25, 1919
Treasurer, Ashland Oil and Gas Company, Main and Center Streets, Ashland, Ohio.

Short, C. L...May 15, 1917
Vice President, Walbert Oil Company, P. O. Box 85, Lawton, Oklahoma.

Shoub, John F...May 20, 1913
Secretary, The Delaware Gas Company, 68 North Sandusky Street, Delaware, Ohio.

Shoup, G. E...May 22, 1918
Agent, Medina Gas and Fuel Company, North Market Street, Wooster, Ohio.

Shriver, Ed. .... May 15, 1917
Foreman, East Ohio Gas Company, 127 North Chestnut Street, Ravenna, Ohio.

Shulters, Hoyt V. .... May 21 ,1912
National City Bank, Cleveland, Ohio.

Shupe, N. E. .... January 26, 1920
Secretary and Treasurer, The Medina Gas and Fuel Company, Box 390 Wooster, Ohio.

Shuster, Z. H. .... May 13, 1920
Superintendent, American Natural Gas Company, Kittanning, Pennsylvania.

Siegrist, R. A. .... May 20, 1919
Cashier, Coshocton Gas Company, Coshocton, Ohio.

Silliman, L. V. .... May 16, 1916
Foreman, Philadelphia Company, 816 Mill Street, Tarentum, Pennsylvania.

Simmons, L. M. .... May 20, 1913
Agent, Clarion Gas Company, Clarion, Pennsylvania.

Simmons, W. P. .... May 16, 1916
Agent, The Manufacturers' Light and Heat Company, 34 South Wade Street, Washington, Pennsylvania.

Simpson, J. M. .... May 18, 1915
Assistant Purchasing Agent, The Ohio Fuel Supply Company, 2017 Farmers' Bank Building, Pittsburgh, Pennsylvania.

Singleton, Bert .... May 16, 1916
Foreman, Hope Natural Gas Company, 108 High Street, Mannington, West Virginia.

Sipe, George B. .... May 19, 1908
Vice President and General Manager, Louisiana Gas Company, Levy Building, Shreveport, Louisiana.

Sipe, William Everett .... May 16, 1911
c/o Arkansas Natural Gas Company, Pine Bluff, Arkansas.

Siverling, J. L. .... May 16, 1916
Field Foreman, The People's Natural Gas Company, Elderton, Pennsylvania.

Slenart, C. D. .... May 20, 1919
Superintendent, Western Distributing Company, Box 1117, Wichita, Kansas.

Slicker, Claude .... October 7, 1920
Secretary-Treasurer, Alum Rock Gas Company, 52 Seneca Street, Oil City, Pennsylvania.

Sloan, B. B. .... April 25, 1919
Agent, United Fuel Gas Company, Inc., 507 East Central Avenue, Ashland, Kentucky.

Sloan, Boyd E. .... February 3, 1920
Agent, People's Natural Gas Company, Main Street, Burgettstown, Pennsylvania.

Sloan, C. T. .... May 15, 1917
Chief Engineer, Pennsylvania Gas Company, Warren, Pennsylvania.

Sloan, F. M. .... May 16, 1916
Operator, Murraysville, Pennsylvania.

Sloan, J. A. .... May 16, 1916
Shop Foreman, The People's Natural Gas Company, Portage, Pennsylvania.

Sloan, R. J. .... May 20, 1919
Division Manager, The Ohio Cities Gas Company, P. O. Drawer 189, Sistersville, West Virginia.

Small, B. A. .... May 20, 1919
McDowell, Small, McKibben Company, 725 Richmond Street, Philadelphia, Pennsylvania.

Smell, J. B. .... May 20, 1919
The East Ohio Gas Company, Shreve, Ohio.

Smies, George H. .... May 20, 1913
Chief Clerk, The Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Smith, A. C. .... May 16, 1916
Operator, 507 Virginia Street, Charleston, West Virginia.

Smith, Cephas C. .... March 24, 1919
Assistant General Secretary, American Petroleum Institute, 19-25 West 44th Street, New York, New York.

Smith, Chauncey W. .... May 20, 1919
Superintendent, Joplin Gas Company, Joplin, Missouri.

Smith, Edward .... May 18, 1915
Chief Clerk, Well Accounting Department, The East Ohio Gas Company, 1513 Lincoln Avenue, Cleveland, Ohio.

Smith, Elmer A. .... May 16, 1916
Auditor, American Natural Gas Company, 1511 Park Building, Pittsburg, Pennsylvania.

Smith, Ernest B. .... May 18, 1909
Manager, The Coshocton Gas Company, Bachert Building, Coshocton, Ohio.

Smith, E. M. .... May 17, 1920
Accountant, The River Gas Company, 324 Fourth Avenue, Marietta, Ohio.

Smith, Frank N. .... May 18, 1915
Pattern Superintendent, S. R. Dresser Manufacturing Company, 170 Davis Street, Bradford, Pennsylvania.

Smith, H. L. .... May 16, 1916
District Foreman, Equitable Gas Company, 147 East Fifth Avenue, Homestead, Pennsylvania.

Smith, H. L. .... May 16, 1916
Auditor, Carnegie Natural Gas Company, 922 Carnegie Building, Pittsburgh, Pennsylvania.

Smith, J. C. W. .... May 20, 1919
Manager, Buckeye Plumbing Company, Monroe, Louisiana.

Smith, J. S. .... April 26, 1919
Local Manager, The Logan Natural Gas and Fuel Company, 102 East Main Street, Ashland, Ohio.

Smith, Malcolm C. .... October 8, 1920
Engineer, American Natural Gas Company, 1510 Park Building, Pittsburgh, Pennsylvania.

Smith, O. W. .... April 23, 1919
Director, The Commercial Oil and Gas Company, Ashtabula, Ohio.

Snider, C. B. .... May 15, 1917
Box 198, Brownwood, Texas.

Snider, Elmer A. .... April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Industrial, West Virginia.

Snider, L. E. .... May 20, 1919
Comp. Station Superintendent, Wichita Pipe Line Company, Bigheart, Oklahoma.

Snoke, Alpheus .... May 18, 1915
Field Superintendent, The Logan Natural Gas and Fuel Company, 900 Mechanic Street, Utica, Ohio.

Snyder, C. C. .... May 17, 1920
Cashier, The Logan Natural Gas and Fuel Company, P. O. Box 295, Lancaster, Ohio.

Snyder, F. Marion .... March 28, 1919
Contractor and Manager, Shelby Oil and Gas Company, 133½ North Main Street, Mansfield, Ohio.

Snyder, K. I. .... January 31, 1920
Foreman, Arkansas Natural Gas Company, 404 West Second Street, Hope, Arkansas.

Snyder, W. H. .... May 22, 1918
Oil and Gas Producer, W. H. Snyder, 224 E. E. Avenue (East End), Beaver, Pennsylvania.

Soper, R. G. .... May 16, 1911
Secretary, The Dallas Gas Company, 2016 Jackson Street, Dallas, Texas.

South, W. H. .... May 18, 1915
Secretary, Treasurer, General Manager, Randall Gas Company, P. O. Box 554, Morgantown, West Virginia.

Spain, W. H. .... May 16, 1911
District Representative, Oil Well Supply Company, 215 Water Street, Pittsburgh, Pennsylvania.

Spencer, C. H. .... May 15, 1917
Shop Superintendent, Calgary Gas Company, Limited, 215 Sixth Avenue, West, Calgary, Alberta, Canada.

Spettigue, J. B. .... May 19, 1919
Foreman, East Ohio Gas Company, Creed Avenue, Struthers, Ohio.

Spettigue, J. T. .... May 20, 1919
Superintendent, Buckeye State Gas and Fuel Company, Coshocton, Ohio.

Spinning, Charles F. .... May 20, 1919
Sales Manager, The Pittsburgh Screw and Bolt Company, Pitts-

Splane, W. W. .... March 25, 1919
Oil and Gas Producer, Oil City, Pennsylvania.

Sprague, H. H. .... May 17, 1910
President, Sprague Meter Company, 205 Water Street, Bridgeport, Connecticut.

Sprenkle, W. A. .... May 16, 1916
Secretary-Treasurer, Natural Gas Company of West Virginia, 323 Fourth Avenue, Pittsburgh, Pennsylvania.

Stabile, L. W........................................April 26, 1919
District Foreman, The Manufacturers' Light and Heat Company, McKees Rocks, Pennsylvania.

Stacey, J. Frank.......................................May 20, 1919
President Stacey Manufacturing Company, Cincinnati, Ohio.

Stafford, G. M........................................May 15, 1917
Foreman, Pennsylvania Gas Company, 202 East Washington Street, Corry, Pennsylvania.

Staggers, F. F........................................May 20, 1919
Field Foreman, Carnegie Natural Gas Company, Cameron, West Virginia.

Staigers, Charles M........................................May 22, 1918
Box 811, Tulsa, Oklahoma.

Stainbrook, Chris.......................................April 26, 1919
Field Foreman, The Manufacturers' Light and Heat Company, Washington, Pennsylvania.

Stalker, William Hyde.......................................May 7, 1920
Geologist (President), Great Lakes Securities Company, 1035-1036 Nicholas Building, Toledo, Ohio.

Stammers, Ernest Albert.......................................May 19, 1920
Foreman, Dominion Natural Gas Company, 12 Fennel Avenue, Hamilton, Ontario, Canada.

Staniek, A. E........................................May 16, 1916
General Contracting Agent, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Stark, Price.......................................May 17, 1920
Operator, Iroquois Natural Gas Company, Gowanda, New York.

Staub, E. J........................................
Independent Operator, c/o Columbus Club, Bank of Commerce Building, Calgary, Alberta, Canada.

Stearns, G. A........................................
401 Iroquois Building, Buffalo, New York.

Steele, E. C........................................May 17, 1920
Superintendent, Union Natural Gas Company, 48½ Market Square, Chatham, Ontario, Canada.

Stehley, Hartman.......................................April 17, 1919
Assistant Treasurer, Union Natural Gas Corporation, 1607 Union Bank Building, Pittsburgh, Pennsylvania.

Steenbergen, C. L........................................May 19, 1914
Manager, Paris Gas and Electric Company, Paris, Kentucky.

Steere, F. W........................................May 15, 1917
President, Steere Engineering Company, Woodward and Horton Avenues, Detroit, Mich.

Stein, F. V........................................May 16, 1916
City Plant Foreman, Pennsylvania Gas Company, Jamestown, New York.

Stein, W. W........................................May 17, 1920
Assistant Treasurer, Border Gas Company, 619 Salinas Avenue, Laredo, Texas.

Steinecker, A. ....February 28, 1919
Foreman, The East Ohio Gas Company, Massillon, Ohio.

Steinwedell, W. E...........April 22, 1919
Secretary, The Gas Machinery Company, 1900 Euclid Avenue, Cleveland, Ohio.

Stephany, E. J...........January 3, 1919
Industrial Gas Engineer, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Stephens, F. S...........May 15, 1919
Manager, Arkansas Natural Gas Company, East Second Street, Hope, Arkansas.

Stephens, J. O...........May 20, 1919
Superintendent of Drilling, East Ohio Gas Company, Wooster, Ohio.

Stephens, Thomas H...........April 26, 1919
Agent, The Manufacturers' Light and Heat Company, East Liverpool, Ohio.

Sternburg, F. M...........May 19, 1914
Field Foreman, Iroquois Natural Gas Company, Evans Street, Hamburg, New York.

Stevens, Glen..........May 20, 1919
Inventory Man, Union Natural Gas Corporation, 305 Cleveland Avenue, Ashland, Ohio.

Stewart, D. C...........April 26, 1919
Field Foreman, The Manufacturers' Light and Heat Company, Waynesburg, Pennsylvania.

Stewart, S. B...........May 17, 1910
General Contracting Agent, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Stewart, William..........May 16, 1916
General Foreman, Allegheny Heating Company, 603 West Diamond Street, North Side, Pittsburgh, Pennsylvania.

Stinson, Jack..........May 17, 1920
Superintendent, Fort Worth Gas Company, 11th and Throckmorton Streets, Fort Worth, Texas.

Stitt, John C...........May 16, 1916
Field Foreman, Carnegie Natural Gas Company, West Union, West Virginia.

Stoever, H. H...........April 21, 1919
Superintendent, West Virginia and Maryland Gas Company, Keyser, West Virginia.

Stokes, D. J., Jr...........May 16, 1916
Field Superintendent, The Natural Gas Company of West Virginia, Harveys, Greene County, Pennsylvania.

Stone, Frederick W...........May 21, 1907
Manager, Ashtabula Gas Company, 6 Progress Street, Ashtabula, Ohio.

Stoops, T. E...........May 5, 1920
Superintendent, West Virginia and Maryland Gas Company, Frostburg, Maryland.

Stotler, R. M...........May 19, 1908
District Manager, Pittsburgh Meter Company, 605 Victor Building, Kansas City, Missouri.

Stout, Wilber..May 16, 1916
Assistant Geologist, Geological Survey of Ohio, 291 East Northwood Avenue, Columbus, Ohio.

Stovall, Fred A...May 5, 1919
General Manager, Stovall Drilling Company, Monroe, Louisiana.

Strain, W. H...April 30, 1919
Local Manager, The Logan Natural Gas and Fuel Company, Shelby, Ohio.

Strauss, W. A...May 19, 1920
Chief Clerk, East Ohio Gas Company, 19-21 N. High Street, Akron, Ohio.

Streibler, Theo...May 20, 1913
Superintendent of Contracts, Sun Vapor and Gas Street Light Company, 1000 South Market Street, Canton, Ohio.

Strickler, James P...May 21, 1907
Superintendent Distribution, Columbus Gas and Fuel Company, 135 North Front Street, Columbus, Ohio.

Stringer, Harrison..May 18, 1915
Superintendent, Dominion Natural Gas Company, Simcoe, Ontario, Canada.

Stroup, John..May 15, 1917
Foreman, Glenwood Natural Gas Company, Limited, Merlin, Ontario, Canada.

Stroup, J. L...May 17, 1920
Glen Natural Gas Company, Merlin, Ontario, Canada.

Stroup, Lloyd..May 15, 1917
Field Foreman, Dominion Gas Company, Merlin, Ontario, Canada.

Stuart, George J...May 16, 1911
Chief Engineer, Pittsburgh Valve Foundry and Construction Company, 26th Street and A. V. R. R., Box 1016, Pittsburgh, Pennsylvania.

Sullivan, T. O...May 16, 1911
General Manager, Hope Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Sullivans, P. D...May 16, 1916
Foreman, Iroquois Natural Gas Company, 37 Church Street, Buffalo, New York.

Swan, George J...May 18, 1909
Superintendent, Consumers Light, Heat and Power Company, 214 East First Street, Topeka, Kansas.

Swartz, J. K...May 16, 1916
Foreman, Hope Natural Gas Company, Salem, West Virginia.

Sweetman, Michael M...February 27, 1906
Secretary, New York Oil and Gas Company, 316 American Bank Building, Kansas City, Missouri.

Sweetman, W. D...May 16, 1911
Superintendent, People's Gas Light and Coke Company, 1241 West Division Street, Chicago, Illinois.

Swendeman, Joseph E...May 15, 1917
Designer of Specialties for Steam, Water, Oil and Gasoline, 1808 Ridge Avenue, Philadelphia, Pennsylvania.

Sykes, J. D. .... May 16, 1911
Superintendent, The Ohio Fuel Supply Company, 99 North Front Street, Columbus, Ohio.

Tallant, Ralph K. .... May 11, 1920
Engineer, Monongahela Valley Traction Company, Fairmont, West Virginia.

Tanner, C. L. .... April 26, 1920
Superintendent, Newark Natural Gas and Fuel Company, 215 Eddy Street, Newark, Ohio.

Tanner, J. Roy .... May 16, 1911
General Manager, Pittsburgh Valve, Foundry and Construction Company, P. O. Box 1016, Pittsburgh, Pennsylvania.

Tapper, Todd .... May 21, 1919
Rep. Richland Public Service Company, 10 South Park Street, Mansfield, Ohio.

Taussig, John Hawley .... March 8, 1920
Gas Engineer of Sales Department, The U. G. I. Contracting Company, 1401 Arch Street, Philadelphia, Pennsylvania.

Taylor, A. L. .... May 20, 1919
Foreman, Hope Natural Gas Company, Clarksburg, West Virginia.

Taylor, C. O. .... May 20, 1919
Gang Foreman, Hope Natural Gas Company, Bridgeport, West Virginia.

Taylor, George E. .... May 15, 1917
504-507 Coyle and Richardson Building, Charleston, West Virginia.

Taylor, George .... May 15, 1917
Foreman, Alden-Batavia Natural Gas Company, 25 Brooklyn Avenue, Batavia, New York.

Taylor, H. R. .... May 20, 1919
Order Clerk, Hope Natural Gas Company, Clarksburg, West Virginia.

Taylor, William .... May 18, 1920
Manufacturers' Light and Heat Company, 248 Fourth Avenue, Pittsburgh, Pennsylvania.

Teague, O. C. .... May 21, 1912
President, The Utica Gas, Oil and Mining Company, Utica, Ohio.

Teegerstrom, Victor S. .... May 15, 1917
Superintendent, Monroe Gas Company, Monroe, Louisiana.

Tenant, V. G. .... February 19, 1920
Stockholder, P. O. Oil Company, Brave (Greene County), Pennsylvania.

Terry, L. B. .... May 16, 1911
Agent, The East Ohio Gas Company, 19-21 North High Street, Akron, Ohio.

Texter, L. J. .... May 15, 1917
Foreman, Alden-Batavia Natural Gas Company, Pavilion, New York.

Thatcher, J. H. .... May 21, 1912
Manager, Mansfield Gas Company, Jefferson Street, Mansfield, Louisiana.

Thatcher, Pearl..April 28, 1920
Fitter, Logan Natural Gas and Fuel Company, 26 W. Main Street, Chillicothe, Ohio.

Thatcher, Ray..May 20, 1919
Looking after Drilling Tools, East Ohio Gas Company, Wooster, Ohio.

Thiel, B. C...May 14, 1920
Sales Engineer, The C. and G. Cooper Company, Mt. Vernon, Ohio.

Thiel, Martin A...May 18, 1915
Chief Engineer, Gas Engine Department, The C. & G. Cooper Company, 118 East Lamartine Street, Mt. Vernon, Ohio.

Thomas, Edgar..May 20, 1913
Gas Engineer, Hope Engineering Company, Farmers' Bank Building, Pittsburgh, Pennsylvania.

Thomas, Fred H...May 16, 1916
Sales Engineer, The C. & G. Cooper Company, Mt. Vernon, Ohio.

Thomas, Howard V...May 16, 1911
Vice President, West Virginia and Maryland Gas Company, 312 Fidelity Building, Buffalo, New York.

Thompson, A. W...March 17, 1919
President, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Thompson, A. W...May 19, 1919
Pittsburgh Manager, The Continental Supply Company, 1904 Union Bank Building, Pittsburgh, Pennsylvania.

Thompson, D. H...May 20, 1919
Chief Engineer, Hope Natural Gas Company, Mannington, West Virginia.

Thompson, William H...May 16, 1911
Secretary, Ohio Gas and Oil Men's Association, 812 New First National Bank, Columbus, Ohio.

Thompson, W. P...May 15, 1917
55 Kennedy Street, Bradford, Pennsylvania.

Thorpe, Charles H...March 21, 1919
Superintendent, Little Rock Gas and Fuel Company, Little Rock, Arkansas.

Throckmorton, S. H...May 17, 1920
Engineer, Manufacturers' Light and Heat Company, Porters Falls, West Virginia.

Tibbens, W. P...May 20, 1913
Shop Foreman, The East Ohio Gas Company, 10611 Garfield Avenue, Cleveland, Ohio.

Tiffany, S. E...April 21, 1919
Superintendent, West Virginia Central Gas Company, Elkins, West Virginia.

Tillotson, F. H...May 20, 1913
Pennsylvania Gas Company, Erie, Pennsylvania.

Tims, H. S...May 18, 1915
Treasurer, The Canadian Western Natural Gas, Light, Heat and Power Company, Limited, 215 Sixth Avenue, West, Calgary, Alberta, Canada.

Tipper, T. C.......................................May 20, 1919
President, T. C. Tipper and Company, 2005 Jenkins Arcade, Pittsburgh, Pennsylvania.

Tippett, W. H.......................................May 19, 1908
President, Creek County Gas Company, Box 126, Cushing, Oklahoma.

Titzel, J. C.......................................May 16, 1916
Glenshaw Gas Company, 7 East Park Way, North Side, Pittsburgh, Pennsylvania.

Titzel, R. John......................................May 15, 1917
Gas Engineer, United Gas Electric Engineering Corporation, 2100 First Avenue, Birmingham, Alabama.

Toberg, David......................................May 8, 1919
Land Department, The People's Natural Gas Company, Bellevue, Pennsylvania.

Tomb, Frank B.......................................May 18, 1915
Empire Oil and Gas Company, Winchester, Kentucky.

Tomer, Adam......................................May 16, 1916
Shop Foreman, The People's Natural Gas Company, 1919 Forbes Street, Pittsburgh, Pennsylvania.

Tonkin, John......................................May 15, 1917
Vice President and General Manager, Central Kentucky Natural Gas Company, Oil City, Pennsylvania.

Tonkin, John B.......................................May 21, 1912
Vice President and General Manager, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Tonkin, L. L.......................................May 20, 1919
Superintendent Compressing Station, Hope Natural Gas Company, Clarksburg, West Virginia.

Tonkin, T. J.......................................May 20, 1919
Central Kentucky Natural Gas Company, Mt. Sterling, Kentucky.

Tonkin, T. J., Jr.......................................May 15, 1917
Superintendent, Frankfort, Kentucky, Natural Gas Company, 318 Lewis Street, Frankfort, Kentucky.

Tonkin, Wade H.......................................May 16, 1916
Agent, Hope Natural Gas Company, 250 West Tenth Street, Parkersburg, West Virginia.

Topp, A. A.......................................May 15, 1917
Foreman, Central Repair Shop, The Ohio Fuel Supply Company, Mt. Vernon, Ohio.

Torrance, C. E.......................................May 16, 1916
Agent, The People's Natural Gas Company, Altoona, Pennsylvania.

Torrance, E. E.......................................May 15, 1917
Foreman, Frost Gas Company, Fredonia, New York.

Torrance, J. M.......................................May 16, 1916
Agent, The People's Natural Gas Company, 28 North Walnut Street, Blairsville, Pennsylvania.

Towl, Forrest M.......................................May 21, 1912
President, Southern Pipe Line Company, Room 1000, 18 Broadway, New York, New York.

Toy, G. H. .... April 24, 1919
Foreman, Equitable Gas Company, 1341 Pointview Street, Pittsburgh, Pennsylvania.

Tracy, F. B .... May 16, 1916
Manager, Muncie Division, Central Indiana Gas Company, 301 East Main Street, Muncie, Indiana.

Tracy, Frederick D. .... May 16, 1911
Purchasing Agent, West Virginia and Maryland Gas Company, 312 Fidelity Building, Buffalo, New York.

Tragesser, H. F. .... March 4, 1920
Foreman, East Ohio Gas Company, Dennison, Ohio.

Trainer, J. E. .... May 18, 1915
President, Sun Gas Company, Salem, West Virginia.

Treat, Ellis M. .... May 16, 1911
President, The Summerfield Gas Company, 1212 Union Bank Building, Pittsburgh, Pennsylvania.

Trees, J. C. .... May 16, 1911
President, Arkansas Natural Gas Company, Benedum-Trees Building, Pittsburgh, Pennsylvania.

Treleaven, L. G. .... May 21, 1907
Receiver, Consumers Light, Heat and Power Company, 200 West Sixth Street, Topeka, Kansas.

Troutman, P. A. .... May 16, 1916
Division Superintendent, Carnegie Natural Gas Company, Sherman and Sixth Streets, Waynesburg, Pennsylvania.

Truscott, H. J. .... March 12, 1919
Foreman, The East Ohio Gas Company, Kent, Ohio.

Tucker, Calvert C. .... May 15, 1917
Engineer, Dominion Natural Gas Company, 842 Marine National Bank Building, Buffalo, New York.

Tunstall, H. E. .... May 6, 1920
Traveling Auditor, The People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Turner, Lyle .... May 20, 1913
Agent, The East Ohio Gas Company, East Ohio Gas Building, Cleveland, Ohio.

Tyng, Arthur .... May 15, 1917
Consulting Engineer, Iroquois Natural Gas Company, 709 Iroquois Building, Buffalo, New York.

Underhill, H. L. .... May 13, 1919
Engineer, Bartlett Hayward Company, Baltimore, Maryland.

Underwood, J. B. .... May 20, 1919
Main Line Foreman, Reserve Gas Company, Ellenboro, West Virginia.

Upham, James A. .... May 10, 1919
Superintendent, Upham Gas Company, Nt. Vernon, Ohio.

Vallely, George J. .... April 26, 1919
Agent, The Manufacturers' Light and Heat Company, McDonald, Pennsylvania.

Vance, George B. .... May 16, 1916
Superintendent, Drilling Department, Randall Gas Company, Mapletown, Pennsylvania.

Vanderziel, J. C...........May 7, 1920
Proportional Meter Inspector, Logan Natural Gas and Fuel Company, 421 South 14th Street, Richmond, Indiana.

Van Sickel, Walter S...........May 17, 1910
General Manager, Southwestern General Gas Company, 301 Garrison Avenue, Fort Smith, Arkansas.

Voelkle, L. P...........May 18, 1915
Chief Clerk, The East Ohio Gas Company, Youngstown, Ohio.

Wade, Frank S...........May 3, 1919
Superintendent, Southern Counties Gas Company, 724 South Spring Street, Los Angeles, California.

Wagner, E. W...........May 20, 1919
East Ohio Gas Company, Cleveland, Ohio.

Walker, A. W...........May 20, 1919
Foreman, Hope Natural Gas Company, Hastings, West Virginia.

Walker, W. O...........May 16, 1916
Secretary-Treasurer, Frankfort (Kentucky) Natural Gas Company, 206 Seneca Street, Oil City, Pennsylvania.

Wallace, E. C...........May 17, 1920
Foreman, United Natural Gas Company, Brookville, Pennsylvania.

Wallace, H. A...........May 18, 1915
General Manager, United Fuel Gas Company, 919 Quarrier Street, Charleston, West Virginia.

Wallace, J. B...........May 18, 1915
Superintendent, Logan Natural Gas and Fuel Company, 134 College Avenue, Ashland, Ohio.

Wallace, Robert J...........May 22, 1918
Superintendent Contracts, Empire Companies, Empire Building, Bartlesville, Oklahoma.

Walsh, D. C...........May 20, 1913
General Foreman, The East Ohio Gas Company, 400 Tuscarawas Avenue, Canton, Ohio.

Walsh, John H...........May 20, 1913
Superintendent, Iroquois Natural Gas Company, Church and Franklin Streets, Buffalo, New York.

Walsh, Maurice W...........February 27, 1906
Superintendent, Distribution and Construction, The Louisville Gas and Electric Company, 311 West Chestnut Street, Louisville, Kentucky.

Walter, Fred A...........April 30, 1919
Cashier, The Logan Natural Gas and Fuel Company, 28 South Park Street, Mansfield, Ohio.

Walters, C. K...........May 16, 1916
District Foreman, Equitable Gas Company, Chestnut and Lydia Streets, Carnegie, Pennsylvania.

Walton, J. D...........May 18, 1915
Iroquois Natural Gas Company, Buffalo, New York.

Ward, Charles A...........October 6, 1920
President and Treasurer, The Dayton Gas Company, Dayton, Ohio.

Ward, C. F...........May 16, 1916
Foreman, Construction Department, Ohio Fuel Supply Company, Homer, Ohio.

Ward, R. W. .... May 20, 1913
Foreman, United Natural Gas Company, Oil City, Pennsylvania.

Wardell, Charles W. .... May 20, 1913
Welsbach Company, Gloucester, New Jersey.

Waring, C. H. .... May 21, 1912
Northern Indiana Gas and Electric Company, Lafayette, Indiana.

Warne, R. .... April 24, 1919
Shop Foreman, Pittsburgh and West Virginia Gas Company, Grafton, West Virginia.

Waterbury, Gordon B. .... May 19, 1920
Clerk, Dominion Natural Gas Company, 112 Ontario Avenue, Hamilton, Ontario, Canada.

Watson, Lee A. .... May 11, 1919
Producer, 1462 Bell Avenue, Lakewood, Ohio.

Watson, W. E. .... May 21, 1912
Assistant General Manager of Sales, The Youngstown Sheet and Tube Company, Youngstown, Ohio.

Watts, Albert E. .... May 21, 1912
Commonwealth Petroleum Corporation, 120 Broadway, Room 3114, New York, New York.

Watts, Harry P. .... May 15, 1917
c/o Commonwealth Petroleum Corporation, 120 Broadway, New York.

Way, Charles D. .... March 13, 1920
Superintendent, Manufacturers' Gas Co., Main Street, Brookville, Pennsylvania.

Way, William B. .... May 18, 1909
Secretary and Treasurer, The Natural Gas Association of America, 904-905 Oliver Building, Pittsburgh, Pennsylvania.
Secretary, The Association of Natural Gas Supply Men, Pittsburgh, Pennsylvania.

Weaks, George G. .... May 20, 1919
Vice President, Monroe Gas Company, Monroe, Louisiana.

Wearing, George E. .... May 16, 1916
General Manager, Consumers Gas Company, Midland Gas Company, Warsaw Gas Company, Opera House Building, Johnsonburg, Pennsylvania.

Weaver, S. D. .... May 16, 1916
Agent, Manufacturers' Light and Heat Company, 23 Chautauqua Street, Bradford, Pennsylvania.

Webber, Daniel S. .... May 20, 1913
Superintendent Lease Department, The Ohio Fuel Supply Company, Columbus, Ohio.

Wege, Henry P. .... May 15, 1917
Oil Well, Refinery and Mill Supplies, Henry P. Wege, 24 Horn Avenue, Oil City, Pennsylvania.

Weiblen, H. A. .... April 23, 1919
Director, The Commercial Oil and Gas Company, 52 Lake Street, Ashtabula, Ohio.

Weidman, J. C. .... May 20, 1919
Physician, People's Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Weil, A. Leo......................................April 26, 1919
General Counsel, The Manufacturers' Light and Heat Company, 810 Frick Building, Pittsburgh, Pennsylvania.

Weil, W. G.......................................January 28, 1920
Agent, The People's Natural Gas Company, 1107 Maple Avenue, Turtle Creek, Pennsylvania.

Weir, James B.......................................May 18, 1915
Secretary-Treasurer, Falling Rock Cannel Coal Company, National City Bank Building, Charleston, West Virginia.

Weisser, F. L.......................................May 20, 1919
Superintendent Gas Department, San Antonio Public Service Company, San Antonio, Texas.

Welker, George E.......................................May 20, 1913
United Natural Gas Company, Oil City, Pennsylvania.

Welker, L. E.......................................April 19, 1919
Civil Engineer, The Ohio Fuel Supply Company, 97 North Front Street, Columbus, Ohio.

Wells, George......................................April 24, 1919
Foreman, Philadelphia Company, Jefferson, Pennsylvania.

Wentzel, Howard W.......................................May 16, 1916
Special Agent, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Werner, E. M.......................................May 20, 1913
Superintendent, Lease Department, The East Ohio Gas Company, 1405 East Sixth Street, Cleveland, Ohio.

West, Olandus......................................May 22, 1918
President, Vesper Oil and Gas Company, Empire Building, Clarksburg, West Virginia.

West, R. H.......................................April 26, 1919
Agent, The Manufacturers' Light and Heat Company, Steubenville, Ohio.

Westcott, Henry P.......................................May 21, 1907
Engineer, Metric Metal Works, 1004 West 26th Street, Erie, Pennsylvania.

Weymouth, Thomas R.......................................May 16, 1911
Chief Engineer, United Natural Gas Company, 308 Seneca Street, Oil City, Pennsylvania.

Wheeler, Edward M.......................................May 21, 1912
Treasurer, West Virginia Central Gas Company, 312 Fidelity Building, Buffalo, New York.

Whitcomb, E. C.......................................May 19, 1914
Chief Engineer, The Logan Natural Gas and Fuel Company, 344 West Walnut Street, Ashland, Ohio.

Whitcomb, E. P.......................................May 18, 1909
President and General Manager, The Union Natural Gas Corporation, 1607 Union Bank Building, Pittsburgh, Pennsylvania.

White, A. A.......................................May 20, 1919
Well Foreman, Hope Natural Gas Company, Weston, West Virginia.

White, David......................................May 16, 1916
Foreman, Hope Natural Gas Company, Smithville, West Virginia.

White, George....................May 19, 1919
Secretary and Treasurer, Permian Oil and Gas Company, Marietta, Ohio.

Whitehead, L. K....................June 12, 1906
Superintendent, Gas Department, Southwestern Gas and Electric Company, 122 East Broad Street, Texarkana, Texas.

Whitfield, Burton L....................May 8, 1919
Foreman, Regulator Men, The People's Natural Gas Company, 309 Summit Street, Knoxville, Pennsylvania.

Whitney, George A....................May 20, 1919
Field Correspondent, Oil City Derrick and Oil and Gas Journal, Box 98, Main P. O., Toledo, Ohio.

Wickens, H. J....................September 22, 1919
Drilling Contractor, Texas and Pacific Coal and Oil Company, Strawn, Texas.

Wickersham, R. C....................May 19, 1920
Operating Engineer, The Koppers Company, 123 North Negley Avenue, Pittsburgh, Pennsylvania.

Wickett, Gordon D....................May 18, 1915
Vice President and Treasurer, Windsor Gas Company, Limited, 33 Chatham Street, West, Windsor, Ontario, Canada.

Wickham, T. F....................May 20, 1913
Second Vice President, Union Gas and Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Wikoff, J. B....................May 16, 1911
The Ohio Fuel Supply Company, 2017 Farmers Bank Building, Pittsburgh, Pennsylvania.

Willet, Lewis E....................May 18, 1920
Vice President, Union Petroleum Company, 1028 White Building, Buffalo, New York.

Williams, C. W....................May 17, 1920
Division Foreman, East Ohio Gas Company, Peninsula, R. F. D. No. 15, Summit County, Ohio.

Williams, Eli, Jr....................January 28, 1919
Foreman, East Ohio Gas Company, Niles, Ohio.

Williams, John B....................May 16, 1911
Secretary-Treasurer, The Sarnia Gas and Electric Company, Ltd., 227 North Front Street, Sarnia, Ontario, Canada.

Williams, John H....................May 16, 1916
General Superintendent, Sun Company, American Exchange National Bank Building, Dallas, Texas.

Williams, R. J....................May 20, 1913
Chief Engineer, United Natural Gas Company, R. D. No. 2, Kane, Pennsylvania.

Williams, W. A....................May 20, 1913
General Manager, Empire Gas and Fuel Company, 60 Wall Street, New York, New York.

Williams, W. A....................May 15, 1917
Superintendent, West Virginia Central Gas Company, Weston, West Virginia.

Williamson, E. W....................May 16, 1916
Assistant Manager, Hope Natural Gas Company, William Penn Way, Pittsburgh, Pennsylvania.

Williamson, T. E...April 21, 1919
Superintendent, West Virginia Central Gas Company, Belington, West Virginia.

Willoughby, Horace..May 18, 1909
Assistant Manager, Scioto Valley Supply Company, Third and Long Streets, Columbus, Ohio.

Wilson, A. M...May 16, 1911
906 West Seventh Street, Tulsa, Oklahoma.

Wilson, Henry M...May 16, 1911
District Agent, Pittsburgh Valve, Foundry and Construction Company, 1250 Rockefeller Building, Cleveland, Ohio.

Wilson, J. C...May 21, 1912
Engineer, Cutler Hammer Manufacturing Company, Twelfth Street and Saint Paul Avenue, Milwaukee, Wisconsin.

Wilson, T. C...August 9, 1920
Material Auditor, The Ohio Fuel Supply Company, 2017 Farmers' Bank Building, Pittsburgh, Pennsylvania.

Wilson, Thomas B...May 13, 1920
Field Superintendent, American Natural Gas Company, 9406 Frankstown Road, Pittsburgh, Pennsylvania.

Wilson, W. E...May 15, 1917
Agent, Pennsylvania Gas Company, 100 West Main Street, Corry, Pennsylvania.

Wilt, Claude..May 20, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Orlando, West Virginia.

Winans, W. B. S...August 22, 1918
Assistant General Auditor, Henry L. Doherty and Company, 60 Wall Street, New York, New York.

Wineland, J. H...April 18, 1919
Local Manager, The Logan Natural Gas and Fuel Company, Clyde, Ohio.

Wise, Bud..April 26, 1919
Field Clerk, The Manufacturers' Light and Heat Company, Cameron, West Virginia.

Witkovski, F. D...May 15, 1917
Chief Inspector, Union Natural Gas Company of Canada, Limited, 95 Wellington Street, Chatham, Ontario, Canada.

Witman, A. C...May 20, 1919
Manager, Peerless Stove and Manufacturing Company, 1558 Bryden Road, Columbus, Ohio.

Witte, J. H...January 23, 1920
Agent, Malta and McConnellsville Gas Company, Malta, Ohio.

Wittmer, George, Jr...May 16, 1911
Treasurer, American Natural Gas Company, 1511 Park Building, Pittsburgh, Pennsylvania.

Wittmer, Henry..May 18, 1909
Secretary, American Natural Gas Company, 407 Park Building, Pittsburgh, Pennsylvania.

Wittmer, Thomas..May 17, 1910
Division Superintendent, American Natural Gas Company, 1013 Sheridan Avenue, Pittsburgh, Pennsylvania.

Wolfe, W. W. .... May 19, 1914
Assistant Secretary, United Fuel Gas Company, 1804 Quarrier Street, Charleston, West Virginia.

Wolfelt, J. E. .... May 5, 1920
Foreman, Logan Natural Gas and Fuel Company, 111 East North Street, Fostoria, Ohio.

Wonderley, W. V. .... May 16, 1916
Superintendent, Compression Plants, Logan Natural Gas and Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Wood, L. S. .... May 15, 1917
Foreman, Pennsylvania Gas Company, Conewango Avenue, Warren, Pennsylvania.

Wood, W. L., Jr. .... May 17, 1910
General Manager, Southwestern Gas and Electric Company, 116 East Broad Street, Texarkana, Arkansas.

Wooddell, A. V. .... May 14, 1919
Field Agent, Pittsburgh and West Virginia Gas Company, Weston, West Virginia.

Woodworth, R. B. .... May 16, 1911
Advertising Manager, Carnegie Steel Company, Carnegie Building, Pittsburgh, Pennsylvania.

Woodyard, David R. .... May 4, 1920
Fitter, Logan Natural Gas and Fuel Company, 67 North Sugar Street, Chillicothe, Ohio.

Wooster, F. E. .... May 20, 1919
Lucey Manufacturing Company, Sixth Floor Chamber of Commerce Building, Pittsburgh, Pennsylvania.

Wrenn, J. W. .... May 20, 1913
Manager, Economic Gas Company, 345 South Hill Street, Los Angeles, California.

Wyer, Samuel S. .... May 21, 1912
Consulting Engineer, Hartman Building, Columbus, Ohio.

Yardley, George .... May 19, 1920
Gasoline Sales, United Natural Gas Company, 308 Seneca Street, Oil City, Pennsylvania.

Yates, H. D. .... May 18, 1920
Treasurer, General Manager, South Branch Gasoline Company, Vice President Pure Gasoline Company, 17 Sherman Street, Bradford, Pennsylvania.

Yoho, S. M. .... May 18, 1920
District Foreman, Carnegie Natural Gas Company, First Street, Mannington, West Virginia.

Yonally, M. F. .... March 4, 1920
Foreman, East Ohio Gas Company, Akron, Ohio.

Yorke, Patrick .... May 16, 1911
Manager, Yorke Derrick Company, 199 North Main Street, Washington, Pennsylvania.

Yost, Charles C. .... April 26, 1919
Cashier, The Logan Natural Gas and Fuel Company, Chillicothe, Ohio.

Young, C. A. .... May 20, 1919
Foreman, The Connecting Gas Company, Glouster, Ohio.

Young, Friend S. .... May 20, 1919
Gang Foreman, Hope Natural Gas Company, R. D. No. 1, Proctor, West Virginia.

Young, James M. H. .... February 27, 1906
Manager, City Gas Company, 215 Dundar Street, London, Ontario, Canada.

Young, R. W. H. .... April 24, 1919
Superintendent Producer Plant, Equitable Gas Company, 3416 Parkview Street, Pittsburgh, Pennsylvania.

Young, T. N. .... May 19, 1919
Clerk, Hope Natural Gas Company, Salem, West Virginia.

Young, W. H. .... April 23, 1919
President, The Commercial Oil and Gas Company, Ashtabula, Ohio.

Young, W. H. .... May 16, 1916
514 Frick Building, Pittsburgh, Pennsylvania.

Young, William T. .... May 20, 1913
Assistant General Superintendent, United Natural Gas Company, 101 West Fourth Street, Oil City, Pennsylvania.

Zarbaugh, C. W. .... May 20, 1919
Foreman Hastings Gasoline, Hope Natural Gas Company, Hastings, West Virginia.

Zeigler, G. H. .... May 17, 1920
Salesman, Pittsburgh Gage and Supply Company, 30th and Liberty Streets, Pittsburgh, Pennsylvania.

Zeller, S. E. .... May 20, 1913
General Foreman, The East Ohio Gas Company, 322 Wooster Avenue, Canal Dover, Ohio.

Zimmerman, C. W. .... May 16, 1916
Chief Clerk, Philadelphia Company, 435 Sixth Avenue, Pittsburgh, Pennsylvania.

Zimmerman, George W. .... May 13, 1920
Field Superintendent, American Natural Gas Company, 1218 Victoria Avenue, New Kensington, Pennsylvania.

Zinn, Lawrence H. .... April 24, 1919
Foreman, Pittsburgh and West Virginia Gas Company, Pennsboro, West Virginia.

Zorn, W. H. .... May 19, 1920
Chief Engineer, Medina Gas and Fuel Company, Drawer 390, Wooster, Ohio.

SUMMARY OF CLASSES OF MEMBERSHIP.

Honorary Members	
Active Members	
Total	

THE ASSOCIATION OF NATURAL GAS SUPPLY MEN

OFFICERS

President

Wm. McKee....................Chaplin-Fulton Mfg. Co., Pittsburgh, Pa.

Vice President

Fred A. Miller....................S. R. Dresser Mfg. Co., Bradford, Pa.

Treasurer

T. C. Clifford................Pittsburgh Meter Co., East Pittsburgh, Pa.

Secretary

Wm. B. Way...................Natural Gas Association, Pittsburgh, Pa.

Directors

TERMS EXPIRE 1921

Fred A. Miller.................................S. R. Dresser Mfg. Co.
T. C. Clifford.....................................Pittsburgh Meter Co.
Wm. McKee.................................Chaplin-Fulton Mfg. Co.
F. R. Hutchinson....................................Gas Appliance Co.
Larmour Adams.....................................Metric Metal Works

TERMS EXPIRE 1922

O. F. Felix..Equitable Meter Co.
W. B. Glover..Oil Well Supply Co.
B. T. Bechtel ....Mark Mfg. Co.
Wm. B. Way...................................Natural Gas Association
E. S. Rooney...........................Youngstown Sheet & Tube Co.

TERMS EXPIRE 1923

A. W. Thompson...............................Continental Supply Co.
Wm. Patterson......................................Frick & Lindsay Co.
R. A. McKinney..........................Manhattan Rubber Mfg. Co.
F. W. Miner..National Supply Co.
Geo. D. Roper...............................Geo. D. Roper Corporation

MEMBERS OF ASSOCIATION OF NATURAL GAS SUPPLY MEN, 1920

Acme Fishing Tool Co............................Parkersburg, W. Va.
Ajax Iron Works..Corry, Pa.
American Atmos Corporation............................Pittsburgh, Pa.
American Cast Iron Pipe Co.............................. ..Chicago, Ill.
American Foundry & Construction Co....................Pittsburgh, Pa.
American Heater Corporation..........................St. Louis, Mo.
Anchor Packing Co......................................Pittsburgh, Pa.
Augmore Mfg. Co..Cleveland, O.

Bailey Meter Co...Cleveland, O.
Bartlesville Supply Co................................Bartlesville, Okla.
Bessemer Gas Engine Co...............................Grove City, Pa.
Black Steel & Wire Co................................Kansas City, Mo.
Borden Co...Warren, O.
Bovaird & Seyfang Mfg. Co............................Bradford, Pa.
Bradford Motor Works.................................Bradford, Pa.
Bristol, The Co......................................Waterbury, Conn.
Broderick & Bascom Rope Co............................St. Louis, Mo.
Bryant Heater & Mfg. Co...............................Cleveland, O.
Builders Iron Foundry...............................Providence, R. I.
Byers, A. M. Co..Pittsburgh, Pa.

Chaplin-Fulton Mfg. Co.................................Pittsburgh, Pa.
Chapman Valve Mfg. Co..........................Indian Orchard, Mass.
Clark Brothers Co...Olean, N. Y.
Clark & Norton Mfg. Co..............................Wellsville, N. Y.
Cleveland Gas Meter Co...............................Cleveland, O.
Cleveland Tractor Co...................................Cleveland, O.
Colona Manufacturing Co...............................Pittsburgh, Pa.
Colonial Supply Co.....................................Pittsburgh, Pa.
Columbia Gas Stove Co.............................Huntington, W. Va.
Columbian Rope Co.......................................Auburn, N. Y.
Columbus Heating & Ventilating Co......................Columbus, O.
Continental Supply Co..................................St. Louis, Mo.
Cooper, C. & G. Co.....................................Mt. Vernon, O.
Custer Coupling Co......................................Bradford, Pa.
Cutler-Hammer Manufacturing Co......................Milwaukee, Wis.

Dayton Pipe Coupling Co....................................Dayton, O.
Davison, N. C. Gas Burner & Welding Co...............Pittsburgh, Pa.
Doherty, Henry L. Co....................................New York City
Dresser, S. R. Manufacturing Co..........................Bradford, Pa.
Duquesne Burner Service Co...........................Pittsburgh, Pa.

Economy Burner & Eng. Co...........................Pittsburgh, Pa.
Economy Stove Co...Cleveland, O.
Equitable Meter Co....................................Pittsburgh, Pa.
Eriez Stove & Manufacturing Co.............................Erie, Pa.
Estate Stove Co..Hamilton. O.

Famous Oven Manufacturing Co..........................New York City
Fenwick-Reddaway Manufacturing Co....................Newark, N. J.
Fitler, Edwin H. Co.................................Philadelphia. Pa.
Flexible Armored Hose Co..............................Buffalo, N. Y.
Foxboro, The Co.......................................Foxboro, Mass.
Franklin, The Co...Canton, O.
Frick & Lindsay Co...................................Pittsburgh, Pa.

Garlock Packing Co....................................Palmyra, N. Y.
Gas Appliance Co..Cleveland, O.
Gas Age, The..New York City
Gas Engineering & Construction Co....................Pittsburgh, Pa.
Gas Record, The...Chicago, Ill.
Gas Review, The......................................McKeesport, Pa.
General Fire Extinguisher Co........................Providence, R. I.
General Gas Light Co..................................New York City
Germer Stove Co...Erie, Pa.
Gilfillan Machine Co..................................Ebenezer, N. Y.
Goodrich, The B. F. Co..Akron, O.
Grayson, J. H. Manufacturing Co............................Athens, O.

Hammon Coupler Co....................................Pittsburgh, Pa.
Hart, The Manufacturing Co............................Cleveland, O.
Hays Mfg. Co..Erie, Pa.
Hazard Mfg. Co...Chicago, Ill.
Heeter, C. M. Sons & Co......................................Butler, Pa.
Hewitt Rubber Co.......................................Pittsburgh, Pa.
Hoffman Heater Co......................................Pittsburgh, Pa.
Hope Engineering & Supply Co........................Pittsburgh, Pa.
Humphrey Co...Kalamazoo, Mich.

Imperial Belting Co..Chicago, Ill.
Imperial Brass Mfg. Co......................................Chicago, Ill.

Ingersoll-Rand Co....................................Pittsburgh, Pa.
International Hale Gas Mixer Mfg. Co.................Providence, R. I.

Jarecki Manufacturing Co..............................Pittsburgh, Pa.
Jarvies Gas & Oil Burner Co...........................Kansas City, Mo.
Jones & Laughlin Steel Co.............................Pittsburgh, Pa.

Kisselman & Co..Parkersburg, W. Va.
Kobler & Miller Co....................................Buffalo, N. Y.
Koppers Co..Pittsburgh, Pa.

LaBelle Iron Works....................................Steubenville, O.
Larco Wrench & Manufacturing Co.......................Chicago, Ill.
Lattimer-Stevens Co., The.............................Columbus, O.
Leschen & Sons Rope Co................................St. Louis, Mo.
Lucey Manufacturing Corporation.......................Pittsburgh, Pa.
Ludlow Valve Manufacturing Co.........................Pittsburgh, Pa.
Lunkenheimer Co.......................................Cincinnati, O.

Macomber & Whyte Rope Co..............................Kenosha, Wis.
Manhattan Rubber Manufacturing Co.....................Passaic, N. J.
Manley & Barlow Co....................................Corry, Pa.
Maxon Premix Burner Co................................Muncie, Ind.
McKain Fishing Tool Co................................Parkersburg, W. Va.
McKeesport Gas Journal................................McKeesport, Pa.
Metric Metal Works....................................Erie, Pa.
Minneapolis Heat Regulator Co.........................Minneapolis, Minn.
Monroe Calculating Machine Co.........................Buffalo, N. Y.
Moon Manufacturing Co.................................Chicago, Ill.
Moore, Lee C. & Co., Inc..............................Pittsburgh, Pa.
Moser Manufacturing Co................................Kane, Pa.
Mueller Manufacturing Co..............................Decatur, Ill.

National Petroleum News...............................Cleveland, O.
National Supply Co....................................Pittsburgh, Pa.
National Transit Co...................................Oil City, Pa.
National Tube Co......................................Pittsburgh, Pa.
Natural Gas Journal...................................Buffalo, N. Y.
New Bedford Cordage Co., The..........................New York City
New York Belting & Packing Co.........................New York City

Ohio State Stove & Mfg. Co............................Columbus, O.
Oil Trade Journal.....................................New York City
Oil City Boiler Works.................................Oil City, Pa.
Oil Well Supply Co....................................Pittsburgh, Pa.
Oxweld Acetylene Co...................................Chicago, Ill.

Parkersburg Machine Co............................Parkersburg, W. Va.
Parkersburg Rig & Reel Co..........................Parkersburg, W. Va.
Peerless Heater Co....................................Pittsburgh, Pa.
Pennsylvania Furnace & Stove Co..........................Warren, Pa.
Petroleum Publishing Co..................................Tulsa, Okla.
Petroleum Supply Co..................................Steubenville, O.
Pittsburgh Meter Co..............................East Pittsburgh, Pa.
Pittsburgh Reinforced Brazing & Machine Co.............Pittsburgh, Pa.
Pittsburgh Valve & Fittings Co.........................Pittsburgh, Pa.
Pittsburgh Valve Foundry & Construction Co............Pittsburgh, Pa.
Pittsburg Water Heater Co.............................Pittsburgh, Pa.
Plymouth Cordage Co...........................No. Plymouth, Mass.
Pratt & Cady Co., Inc..................................Pittsburgh. Pa.
Precision Instrument Co...............................Detroit, Mich.
Prichard Supply Co............................Mannington, W. Va.
Progressive Age Publishing Co.......................New York City

Rathbun-Jones Engineering Co............................Toledo, Ohio
Reading Iron Works..Reading, Pa.
Jos. Reid Gas Engine Co...................................Oil City, Pa.
Reliable Stove Co...Cleveland, O.
Rensselaer Valve Co.....................................Pittsburgh, Pa.
Republic Iron & Steel Co.............................Youngstown, O.
Republic Rubber Co....................................Youngstown, O.
Republic Supply Co.......................................Houston, Tex.
Reznor Manufacturing Co..................................Mercer, Pa.
Riesenman Manufacturing Co., Ltd.......................Franklin, Pa.
Robinson Packer Co.......................................Tulsa, Okla.
Roebling's, John A. Sons Co............................Trenton, N. J.
Roper, George D. Corporation...........................Rockford, Ill.
Rosendale-Reddaway Belting & Hose Co.................Newark, N. J.
Ruud Manufacturing Co...................................Pittsburgh, Pa.

Safety Gas Stove Lock Co.............................Nashville, Tenn.
Sands Manufacturing Co..................................Cleveland, O.
Sanitary Company of America..............................Linfield, Pa.
Schaeffer & Budenberg Mfg. Co.........................Pittsburgh, Pa.
Selas Co...Canton, O.
South Chester Tube Co.....................................Chester, Pa.
Spang, Chalfant & Co....................................Pittsburgh, Pa.
Sprague Meter Co.....................................Bridgeport, Conn.
Stacey, The Manufacturing Co..........................Cincinnati, O.
Stitt Ignition Co..Columbus, O.
Strause Gas Iron Co..................................Philadelphia, Pa.
Superior Oil & Refining Co..............................Columbus, O.
Symmonds, T. ....Buffalo, N. Y.

Taylor, W. P. Co..Buffalo, N. Y.
Toledo Pipe Threading Machine Co..........................Toledo, O.

Underwood Typewriter Co., Inc............................Buffalo, N. Y.
United Seal Co...Columbus, O.
United States Rubber Co...............................New York City
Union Rubber & Asbestos Co.............................Trenton, N. J.
Upson-Walton Co..Cleveland, O.
Utica Valve & Fixture Co..................................Utica, N. Y.

Welsbach Co......................................Gloucester City, N. J.
Westcott Valve Co..................................Seneca Falls, N. Y.
Western Rope & Manufacturing Co.........................Tulsa, Okla.
Westinghouse Electric & Mfg. Co........................Pittsburgh, Pa.
Wheeling Steel & Iron Co.............................Wheeling, W. Va.
Williamsport Wire Rope Co..........................Williamsport, Pa.
Worthington Pump & Machinery Corp....................Buffalo, N. Y.
Wright Wire Co......................................Worcester, Mass.

York Derrick Co....................................Washington, Pa.
Youngstown Sheet & Tube Co..........................Youngstown, O.